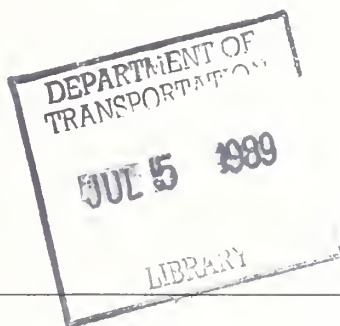


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Department
Transportation
National Highway
Traffic Safety
Administration



DOT HS 807 350
Final Report

September 1988

Final Report of Frontal Barrier Impacts of a 1986 Ford Taurus 4-Door Sedan in Support of Crash III Damage Algorithm Reformation

The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear only because they are considered essential to the object of this report.

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16. Abstract Five 0° flat frontal barrier impact tests were conducted for research and development in support of the crash III damage algorithm reformulation. These tests were conducted on a 1986 Ford Taurus 4-door sedan, VIN 1FABP29UOGA124513, at the Transportation Research Center of Ohio. The following five tests were conducted on one vehicle:																																			
<table border="0"> <thead> <tr> <th>TEST NO.</th> <th>DATE</th> <th>TIME</th> <th>SPEED (mph)</th> <th>AVERAGE CUMULATIVE CRUSH</th> </tr> </thead> <tbody> <tr> <td>880822-1</td> <td>8/22/88</td> <td>1030</td> <td>9.6</td> <td>2.5</td> </tr> <tr> <td>880822-2</td> <td>8/22/88</td> <td>1315</td> <td>19.8</td> <td>8.1</td> </tr> <tr> <td>880822-3</td> <td>8/22/88</td> <td>1540</td> <td>20.1</td> <td>14.1</td> </tr> <tr> <td>880823-1</td> <td>8/23/88</td> <td>1030</td> <td>18.6</td> <td>18.3</td> </tr> <tr> <td>880823-2</td> <td>8/23/88</td> <td>1130</td> <td>30.0</td> <td></td> </tr> </tbody> </table>						TEST NO.	DATE	TIME	SPEED (mph)	AVERAGE CUMULATIVE CRUSH	880822-1	8/22/88	1030	9.6	2.5	880822-2	8/22/88	1315	19.8	8.1	880822-3	8/22/88	1540	20.1	14.1	880823-1	8/23/88	1030	18.6	18.3	880823-2	8/23/88	1130	30.0	
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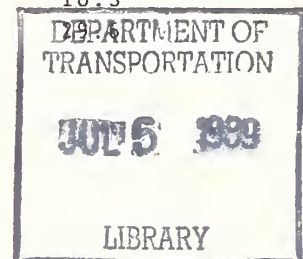


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SECTION 1.0
PURPOSE AND TEST SUMMARY

The purpose of the five 0° frontal barrier impact tests was for research and development in support of the CRASH III damage algorithm reformulation.

The 1986 Ford Taurus was equipped with a 3.0 liter, 4-cylinder, transverse, gas engine with a 3-speed automatic transmission. The intended total test weight of the vehicle was 3460 pounds. The actual weight was 3507 pounds, including 438 pounds of sandbag ballast secured in the trunk area.

The crash event was recorded by two (2) high-speed cameras.

SECTION 2.0
VEHICLE INFORMATION

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Ford Motor Company VIN: 1FABP29UOGA124513

MAKE/MODEL: Ford Taurus MODEL YEAR: 1986

BODY STYLE: 4-door sedan COLOR: Silver

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: 3.0 liter

 X GAS, DIESEL, TURBOCHARGE

TRANSMISSION DATA: 3 SPEED, MANUAL, X AUTOMATIC, X FWD, RWD, 4WD

DATE VEHICLE RECEIVED: 8/16/88 ODOMETER READING: 1848.0

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	Yes
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	No
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	No	REAR WINDOW DEFROSTER	No
OTHER	None		

DATA FROM CERTIFICATION LABEL ON LEFT DOOR FACE OR "B" POST:

VEHICLE MANUFACTURED BY: Ford Motor Company

DATE OF MANUFACTURE: 2/86

GVWR: 4550 LBS.

GAWR: FRONT 2514 LBS.; REAR 2071 LBS.

A rear impact was conducted on the same vehicle.

The front of the vehicle was supported by a dolly.

TEST VEHICLE INFORMATION, CONT'D

WHEELBASE: 104.8

MAXIMUM WIDTH: 69.6

WEIGHT OF TEST VEHICLE WITH REQUIRED OCCUPANTS AND LUGGAGE:

RIGHT FRONT	1124 LBS.	RIGHT REAR	631 LBS.
LEFT FRONT	1139 LBS.	LEFT REAR	613 LBS.
TOTAL FRONT WEIGHT	2263 LBS.	(64.5% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1244 LBS.	(35.5% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3507 LBS.		

WEIGHT OF BALLAST SECURED IN VEHICLE TRUNK AREA: 438 LBS.

VEHICLE TIRE DATA:

TIRES ON VEHICLE (MFR. & LINE, SIZE): General P195/75R14 M + S

RECOMMENDED COLD TIRE PRESSURE: FRONT: 35 psi; REAR: 35 psi

SIDEWALL PLY RATING: 1 ply

BIAS PLY, BELTED OR RADIAL? Radial

IS SPARE TIRE "SPACE SAVER"? Yes

IS SPARE TIRE STANDARD EQUIPMENT? No

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

TEST ANOMALIES

Noise in the form of spikes was observed in the plots for the contact switches OTH1, OTH2, OTH3. The switches were used to record the time of vehicle contact with the wall, as well as the time of vehicle separation from the barrier wall. The switches were damaged by the crush of the vehicle's bumper against the rigid barrier. The switches were replaced following each test which contained spikes. This is not the standard use of such switches.

LOCATION OF CONTACT SWITCHES:

OTH1 Two inches right of the front bumper centerline

OTH2 Front bumper centerline

OTH3 Two inches left of the front bumper centerline

SECTION 3.0

TEST #880822-1 SUMMARY

TEST CONDITIONS:

TEST NUMBER: 880822-1

DATE OF TEST: 8/22/88

TIME OF TEST: 1030

AMBIENT TEMPERATURE AT IMPACT AREA: 80° F

SUBJECT VEHICLE DATA:

	<u>ACTUAL</u>	<u>INTENDED</u>
TEST WEIGHT (lbs.)	3507.0	3460.0
VEHICLE ORIENTATION (deg.)	0.0	0.0
VEHICLE VELOCITY (mph.)	9.6	10.0
MAXIMUM CRUSH (in.)	3.1	
AVERAGE CRUSH = $\frac{\{C1+C6+C2+C3+C4+C5\}}{5}$ (in.)	2.5	

TEST NUMBER 880822-1

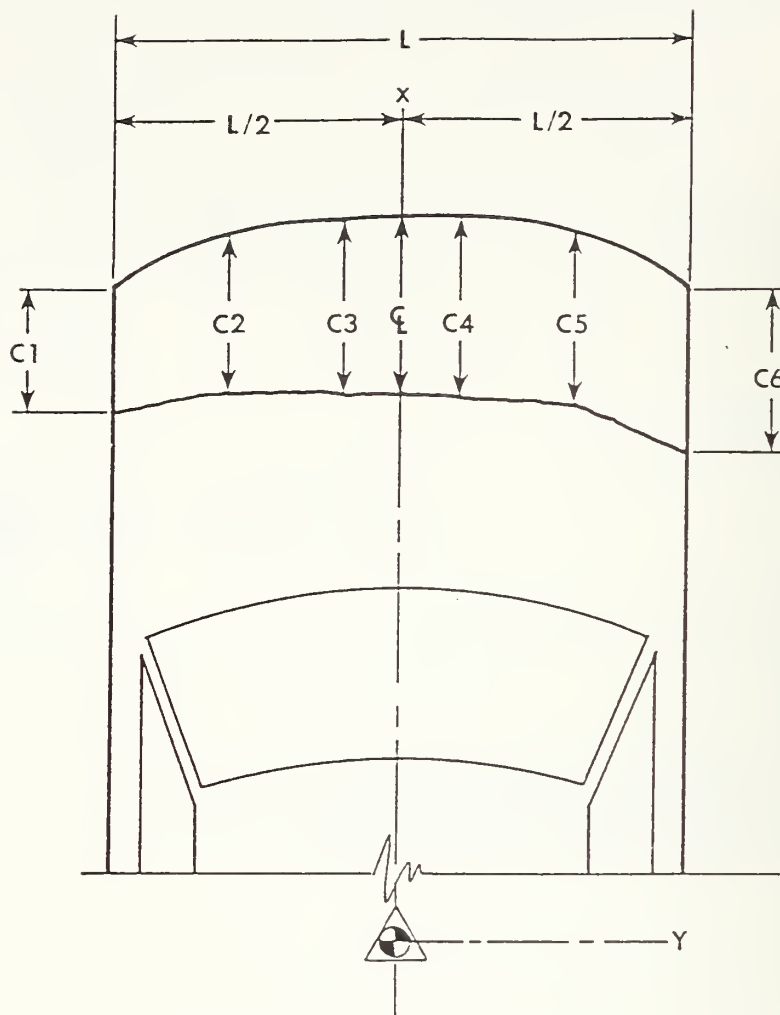
VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

No.	LOCATION	POSITIVE DIRECTION MAX G MSEC		NEGATIVE DIRECTION MAX G MSEC	
1	VEHICLE REAR DECK				
	LONGITUDINAL	1.9	245.1	12.1	44.4
	LATERAL	1.0	75.5	0.6	121.0
	VERTICAL	3.9	85.1	2.8	74.5
	RESULTANT	12.2	44.5		

VEHICLE SEPARATION TIMES:

LEFT SWITCH: 151.0 MSEC
 CENTER SWITCH: 152.0 MSEC
 RIGHT SWITCH: 151.0 MSEC

REFERENCE: X: + FORWARD FROM REAR BUMPER
 Y: + LEFTWARD FROM VEHICLE CENTERLINE
 Z: + UPWARD FROM GROUND LEVEL



NOTE: L is pre-test length of contact surface.
 $C1$ through $C6$ are spaced equally apart.
 CL is taken at centerline of vehicle.
 All measurements are in inches.

Vehicle 1986 Ford Taurus - Test #880822-1

	PRE-TEST	POST-TEST	CRUSH
L	<u>65.5</u>		
$C1$	<u>169.8</u>	$C1$ <u>168.8</u>	$C1$ <u>1.0</u>
$C2$	<u>173.9</u>	$C2$ <u>171.8</u>	$C2$ <u>2.1</u>
$C3$	<u>175.8</u>	$C3$ <u>172.8</u>	$C3$ <u>3.0</u>
$C4$	<u>175.6</u>	$C4$ <u>172.5</u>	$C4$ <u>3.1</u>
$C5$	<u>173.8</u>	$C5$ <u>171.0</u>	$C5$ <u>2.8</u>
$C6$	<u>169.6</u>	$C6$ <u>167.7</u>	$C6$ <u>1.9</u>
CL	<u>175.9</u>	CL <u>172.8</u>	CL <u>3.1</u>

TEST #880822-1

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right side wide	Photosonic 1B	13	500	Impact overall
2	Right side tight	Photosonic 1B	50	500	Impact closeup

SECTION 4.0

TEST #880822-2 SUMMARY

TEST CONDITIONS:

TEST NUMBER: 880822-2

DATE OF TEST: 8/22/88

TIME OF TEST: 1315

AMBIENT TEMPERATURE AT IMPACT AREA: 80° F

SUBJECT VEHICLE DATA:

	<u>ACTUAL</u>	<u>INTENDED</u>
TEST WEIGHT (lbs.)	3507.8	3460.0
VEHICLE ORIENTATION (deg.)	0.0	0.0
VEHICLE VELOCITY (mph.)	19.8	20.0
MAXIMUM CUMULATIVE CRUSH (in.)	8.9	
AVERAGE CUMULATIVE CRUSH $\frac{\{C1+C6+C2+C3+C4+C5\}}{5}$ (in.)	8.1	

2

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

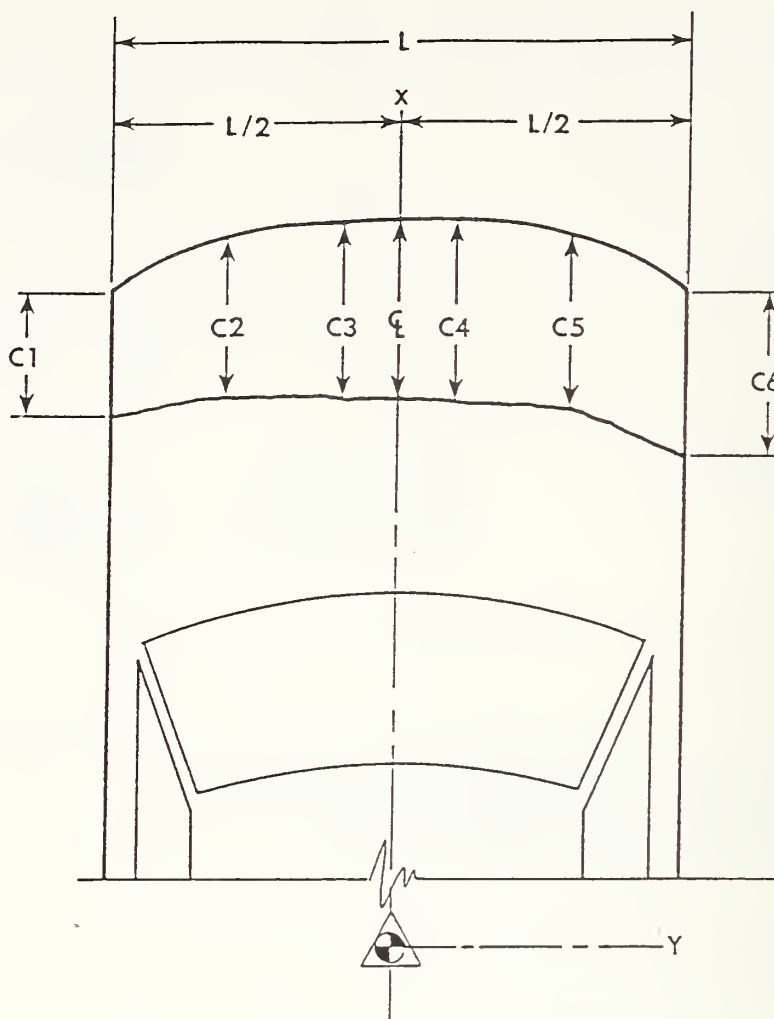
No.	LOCATION	POSITIVE DIRECTION MAX G MSEC		NEGATIVE DIRECTION MAX G MSEC	
1	VEHICLE REAR DECK				
	LONGITUDINAL	10.2	98.9	27.5	39.
	LATERAL	3.8	16.5	2.2	27.
	VERTICAL	13.5	50.1	17.0	40.
	RESULTANT	32.3	40.0		

VEHICLE SEPARATION TIMES:

LEFT SWITCH: --- Y MSEC
 CENTER SWITCH: 132.0 Y MSEC
 RIGHT SWITCH: --- Y MSEC

REFERENCE: X: + FORWARD FROM REAR BUMPER
 Y: + LEFTWARD FROM VEHICLE CENTERLINE
 Z: + UPWARD FROM GROUND LEVEL

Y See TEST ANOMALIES



NOTE: L is pre-test length of contact surface.
 $C1$ through $C6$ are spaced equally apart.
 CL is taken at centerline of vehicle.
 All measurements are in inches.

Vehicle 1986 Ford Taurus - Test #880822-2

PRE-TEST*	POST-TEST	CUMULATIVE CRUSH
L <u>65.5</u>		
$C1$ <u>169.8</u>	$C1$ <u>163.1</u>	$C1$ <u>6.7</u>
$C2$ <u>173.9</u>	$C2$ <u>166.0</u>	$C2$ <u>7.9</u>
$C3$ <u>175.8</u>	$C3$ <u>167.1</u>	$C3$ <u>8.7</u>
$C4$ <u>175.6</u>	$C4$ <u>166.8</u>	$C4$ <u>8.8</u>
$C5$ <u>173.8</u>	$C5$ <u>165.4</u>	$C5$ <u>8.4</u>
$C6$ <u>169.6</u>	$C6$ <u>162.8</u>	$C6$ <u>6.8</u>
CL <u>175.9</u>	CL <u>167.0</u>	CL <u>8.9</u>

*Pre-test measurements taken from test #880822-1.

TEST #880822-2

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right side wide	Photosonic 1B	13	500	Impact overall
2	Right side tight	Photosonic 1B	50	500	Impact closeup

SECTION 5.0

TEST #880822-3 SUMMARY

TEST CONDITIONS:

TEST NUMBER: 880822-3

DATE OF TEST: 8/22/88

TIME OF TEST: 1540

AMBIENT TEMPERATURE AT IMPACT AREA: 80° F

SUBJECT VEHICLE DATA:

	<u>ACTUAL</u>	<u>INTENDED</u>
TEST WEIGHT (lbs.)	3507.0	3460.0
VEHICLE ORIENTATION (deg.)	0.0	0.0
VEHICLE VELOCITY (mph.)	20.1	20.0
MAXIMUM CUMULATIVE CRUSH (in.)	14.9	
AVERAGE CUMULATIVE CRUSH $\{\frac{C1+C6+C2+C3+C4+C5}{5}\}$ (in.)	14.1	

2

TEST NUMBER 880822-3

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

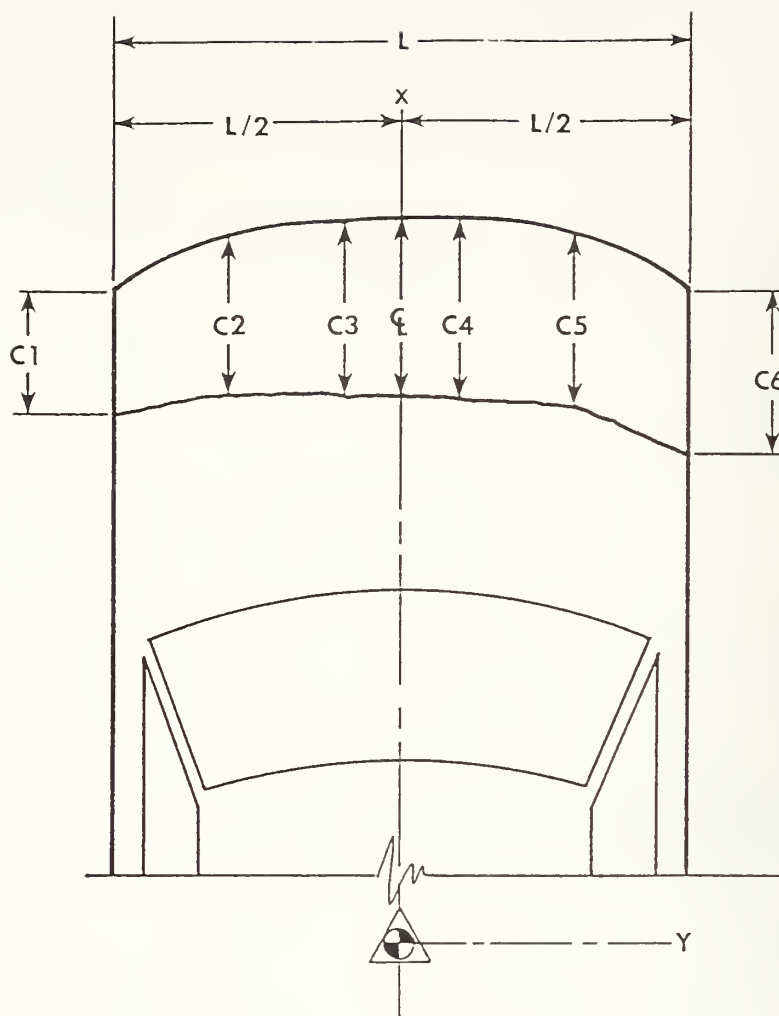
No.	LOCATION	POSITIVE		NEGATIVE	
		DIRECTION		DIRECTION	
		MAX G	MSEC	MAX G	MSEC
1	VEHICLE REAR DECK				
	LONGITUDINAL	32.0	93.8	41.2	41.1
	LATERAL	5.8	98.1	4.3	109.4
	VERTICAL	38.3	108.5	50.7	99.1
	RESULTANT	63.3	99.0		

VEHICLE SEPARATION TIMES:

LEFT SWITCH: ---Y MSEC
 CENTER SWITCH: ---Y MSEC
 RIGHT SWITCH: 123.2 MSEC

REFERENCE: X: + FORWARD FROM REAR BUMPER
 Y: + LEFTWARD FROM VEHICLE CENTERLINE
 Z: + UPWARD FROM GROUND LEVEL

YSee TEST ANOMALIES



NOTE: L is pre-test length of contact surface.
 C1 through C6 are spaced equally apart.
 CL is taken at centerline of vehicle.
 All measurements are in inches.

Vehicle 1986 Ford Taurus - Test #880822-3

	PRE-TEST*	POST-TEST	CUMULATIVE CRUSH
L	<u>65.5</u>		
C1	<u>169.8</u>	C1 <u>157.2</u>	C1 <u>12.6</u>
C2	<u>173.9</u>	C2 <u>160.0</u>	C2 <u>13.9</u>
C3	<u>175.8</u>	C3 <u>161.1</u>	C3 <u>14.7</u>
C4	<u>175.6</u>	C4 <u>160.8</u>	C4 <u>14.8</u>
C5	<u>173.8</u>	C5 <u>159.4</u>	C5 <u>14.4</u>
C6	<u>169.6</u>	C6 <u>156.5</u>	C6 <u>13.1</u>
CL	<u>175.9</u>	CL <u>161.0</u>	CL <u>14.9</u>

*Pre-test measurements taken from test #880822-1.

TEST #880822-3

CAMERA INFORMATION

<u>CAMERA NO.</u>	<u>LOCATION</u>	<u>TYPE</u>	<u>LENS (mm)</u>	<u>SPEED (fps)</u>	<u>PURPOSE OF CAMERA DATA</u>
1	Right side wide	Photosonic 1B	13	500	Impact overall
2	Right side tight	Photosonic 1B	50	500	Impact closeup

SECTION 6.0

TEST #880823-1 SUMMARY

TEST CONDITIONS:

TEST NUMBER: 880823-1

DATE OF TEST: 8/23/88

TIME OF TEST: 1030

AMBIENT TEMPERATURE AT IMPACT AREA: 80° F

SUBJECT VEHICLE DATA:

	<u>ACTUAL</u>	<u>INTENDED</u>
TEST WEIGHT (lbs.)	3507.0	3460.0
VEHICLE ORIENTATION (deg.)	0.0	0.0
VEHICLE VELOCITY (mph.)	18.6	18.5
MAXIMUM CUMULATIVE CRUSH (in.)	19.0	
AVERAGE CUMULATIVE CRUSH $\{\frac{C1+C6+C2+C3+C4+C5}{2}\}/5$ (in.)	18.3	

2

TEST NUMBER 880823-1

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

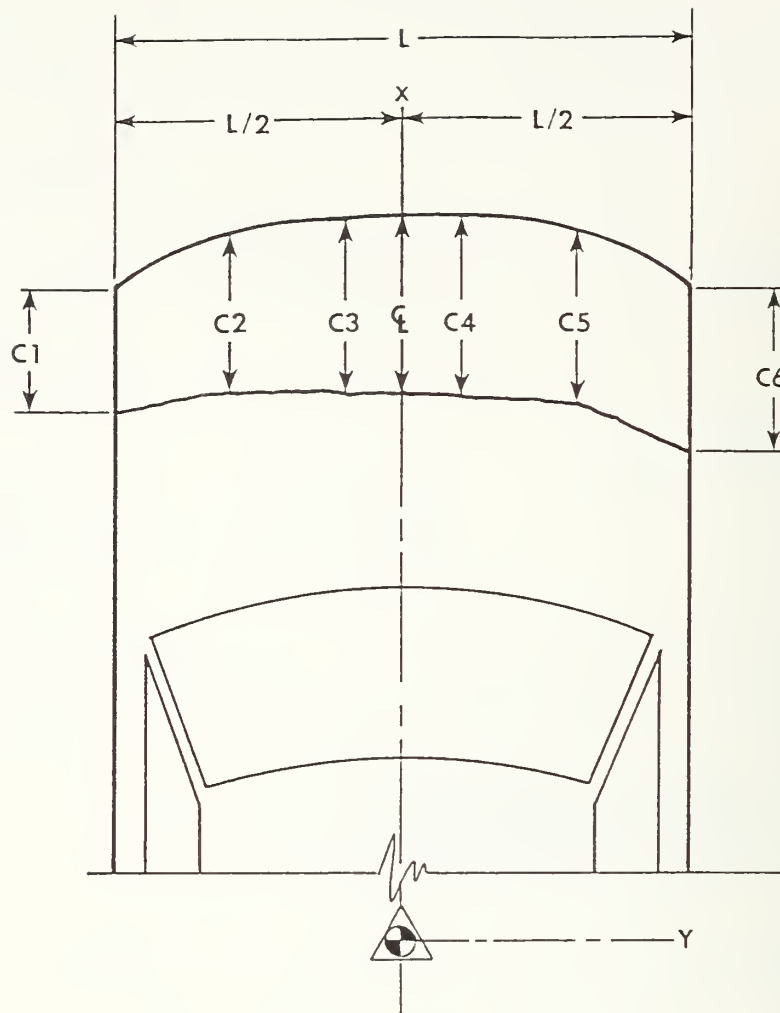
No.	LOCATION	POSITIVE		NEGATIVE	
		DIRECTION		DIRECTION	
		MAX G MSEC		MAX G MSEC	
1	VEHICLE REAR DECK				
	LONGITUDINAL	8.0	132.0	35.7	27.0
	LATERAL	5.5	61.3	4.0	32.0
	VERTICAL	24.0	31.4	21.6	43.0
	RESULTANT	36.1	27.0		

VEHICLE SEPARATION TIMES:

LEFT SWITCH: ---Y MSEC
 CENTER SWITCH: ---Y MSEC
 RIGHT SWITCH: 125.4 MSEC

REFERENCE: X: + FORWARD FROM REAR BUMPER
 Y: + LEFTWARD FROM VEHICLE CENTERLINE
 Z: + UPWARD FROM GROUND LEVEL

YSee TEST ANOMALIES



NOTE: L is pre-test length of contact surface.
 C1 through C6 are spaced equally apart.
 CL is taken at centerline of vehicle.
 All measurements are in inches.

Vehicle 1986 Ford Taurus - Test #880823-1

	PRE-TEST*	POST-TEST	CUMULATIVE CRUSH
L	<u>65.5</u>		
C1	<u>169.8</u>	C1 <u>152.9</u>	C1 <u>16.9</u>
C2	<u>173.9</u>	C2 <u>155.8</u>	C2 <u>18.1</u>
C3	<u>175.8</u>	C3 <u>156.8</u>	C3 <u>19.0</u>
C4	<u>175.6</u>	C4 <u>156.7</u>	C4 <u>18.9</u>
C5	<u>173.8</u>	C5 <u>155.2</u>	C5 <u>18.6</u>
C6	<u>169.6</u>	C6 <u>152.6</u>	C6 <u>17.0</u>
CL	<u>175.9</u>	CL <u>157.0</u>	CL <u>18.9</u>

*Pre-test measurements taken from test #880822-1.

TEST #880823-1

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right side wide	Photosonic 1B	13	500	Impact overall
2	Right side tight	Photosonic 1B	50	500	Impact closeup

SECTION 7.0

TEST #880823-2 SUMMARY

TEST CONDITIONS:

TEST NUMBER: 880823-2

DATE OF TEST: 8/23/88

TIME OF TEST: 1130

AMBIENT TEMPERATURE AT IMPACT AREA: 80° F

SUBJECT VEHICLE DATA:

	<u>ACTUAL</u>	<u>INTENDED</u>
TEST WEIGHT (lbs.)	3507.0	3460.0
VEHICLE ORIENTATION (deg.)	0.0	0.0
VEHICLE VELOCITY (mph.)	30.0	30.0
MAXIMUM CUMULATIVE CRUSH (in.)	31.0	
AVERAGE CUMULATIVE CRUSH $\frac{\{C1+C6+C2+C3+C4+C5\}}{2}$ (in.)	29.6	

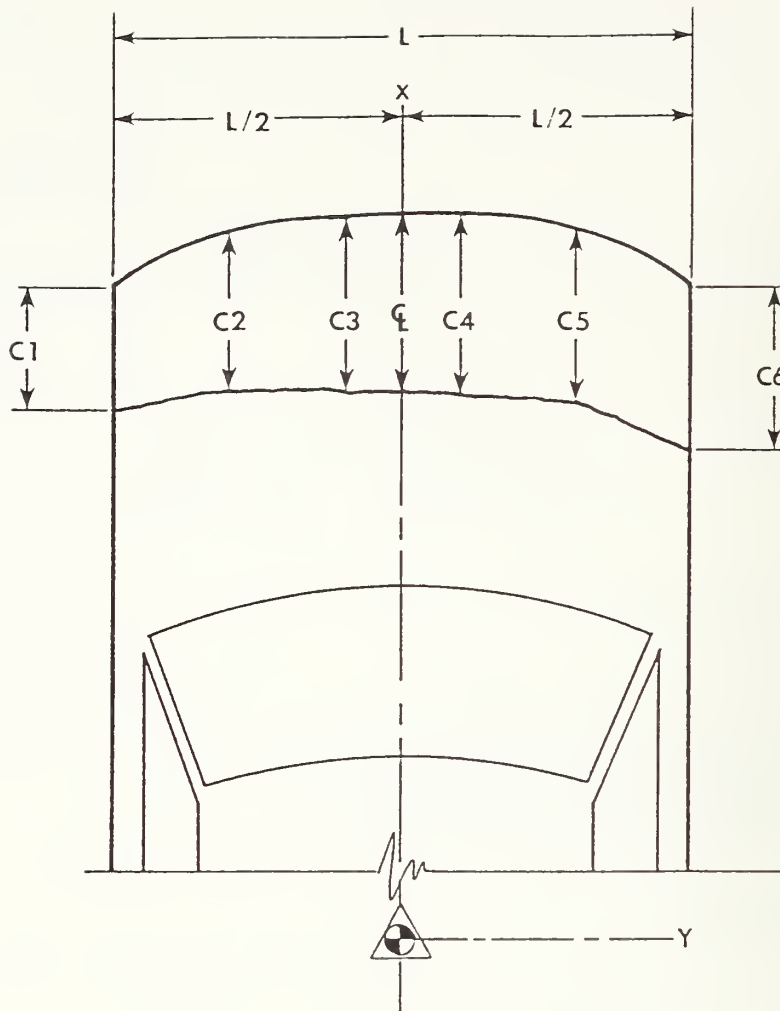
TEST NUMBER 880823-2

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

No. LOCATION	POSITIVE		NEGATIVE	
	DIRECTION		DIRECTION	
	MAX	G MSEC	MAX	G MSEC
1 VEHICLE REAR DECK				
LONGITUDINAL	8.8	216.3	51.1	21.4
LATERAL	5.2	81.5	5.0	51.9
VERTICAL	17.5	49.3	24.6	40.0
RESULTANT	51.4	21.4		
VEHICLE SEPARATION TIMES:				
LEFT SWITCH: ---Y MSEC				
CENTER SWITCH: 152.0YMSEC				
RIGHT SWITCH: 156.4 MSEC				

REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

Y See TEST ANOMALIES

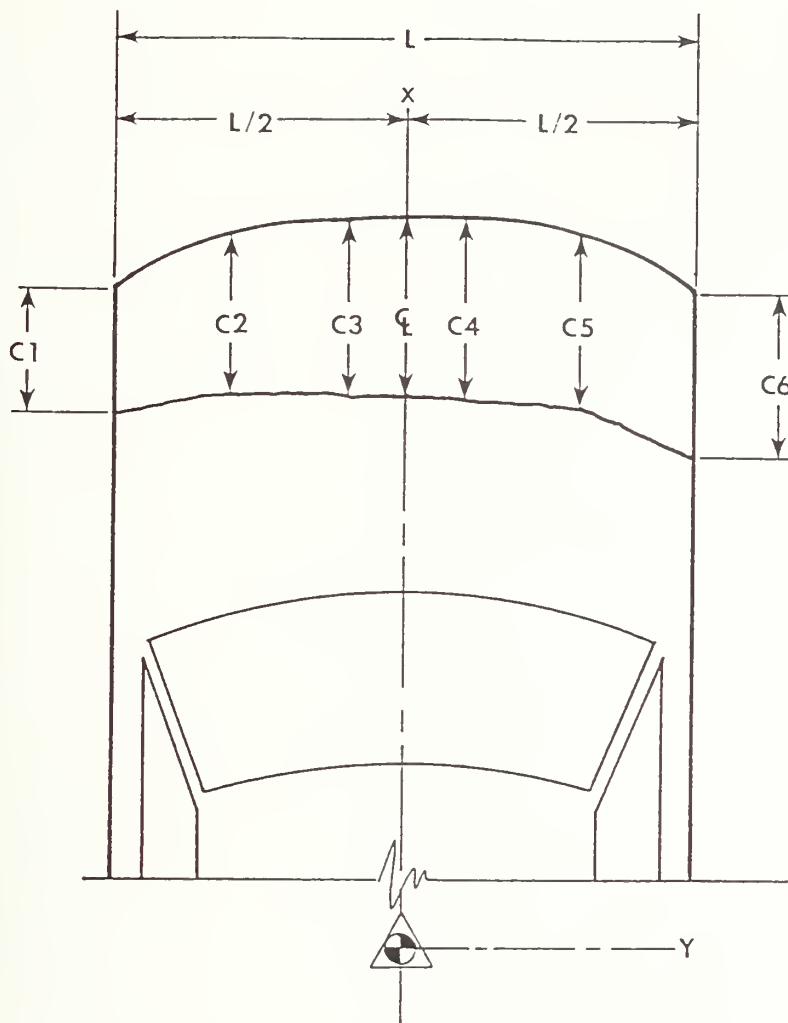


NOTE: L is pre-test length of contact surface.
 C1 through C6 are spaced equally apart.
 CL is taken at centerline of vehicle.
 All measurements are in inches.

Vehicle 1986 Ford Taurus - Test #880823-2

	PRE-TEST*	POST-TEST	CUMULATIVE CRUSH
L	<u>65.5</u>		
C1	<u>169.8</u>	C1 <u>140.8</u>	C1 <u>29.0</u>
C2	<u>173.9</u>	C2 <u>144.0</u>	C2 <u>29.9</u>
C3	<u>175.8</u>	C3 <u>144.8</u>	C3 <u>31.0</u>
C4	<u>175.6</u>	C4 <u>145.2</u>	C4 <u>30.4</u>
C5	<u>173.8</u>	C5 <u>144.7</u>	C5 <u>29.1</u>
C6	<u>169.6</u>	C6 <u>143.0</u>	C6 <u>26.6</u>
CL	<u>175.9</u>	CL <u>145.0</u>	CL <u>30.9</u>

*Pre-test measurements taken from test #880822-1.



NOTE: L is pre-test length of contact surface.
 $C1$ through $C6$ are spaced equally apart.
 CL is taken at centerline of vehicle.
 All measurements are in inches.

Vehicle 1986 Ford Taurus - Test #880823-2

PRE-TEST*	POST-TEST	CUMULATIVE CRUSH
L <u>65.5</u>		
$C1$ <u>169.8</u>	$C1$ <u>140.8</u>	$C1$ <u>29.0</u>
$C2$ <u>173.9</u>	$C2$ <u>144.0</u>	$C2$ <u>29.9</u>
$C3$ <u>175.8</u>	$C3$ <u>144.8</u>	$C3$ <u>31.0</u>
$C4$ <u>175.6</u>	$C4$ <u>145.2</u>	$C4$ <u>30.4</u>
$C5$ <u>173.8</u>	$C5$ <u>144.7</u>	$C5$ <u>29.1</u>
$C6$ <u>169.6</u>	$C6$ <u>143.0</u>	$C6$ <u>26.6</u>
CL <u>175.9</u>	CL <u>145.0</u>	CL <u>30.9</u>

*Pre-test measurements taken from test #880822-1.

TEST #880823-2

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right side wide	Photosonic 1B	13	500	Impact overall
2	Right side tight	Photosonic 1B	50	505	Impact closeup

APPENDIX A
PHOTOGRAPHS

TEST #880823-1

LIST OF PHOTOGRAPHS

1. PRE-TEST OVERALL LEFT SIDE VIEW
2. POST-TEST OVERALL LEFT SIDE VIEW
3. PRE-TEST OVERALL RIGHT SIDE VIEW
4. POST-TEST OVERALL RIGHT SIDE VIEW
5. PRE-TEST OVERALL FRONT VIEW
6. POST-TEST OVERALL FRONT VIEW
7. PRE-TEST LEFT FRONT VIEW
8. POST-TEST LEFT FRONT VIEW
9. PRE-TEST RIGHT FRONT VIEW
10. POST-TEST RIGHT FRONT VIEW



Figure A-1. PRE-TEST OVERALL LEFT SIDE VIEW



Figure A-2. POST-TEST OVERALL LEFT SIDE VIEW



Figure A-3. PRE-TEST OVERALL RIGHT SIDE VIEW

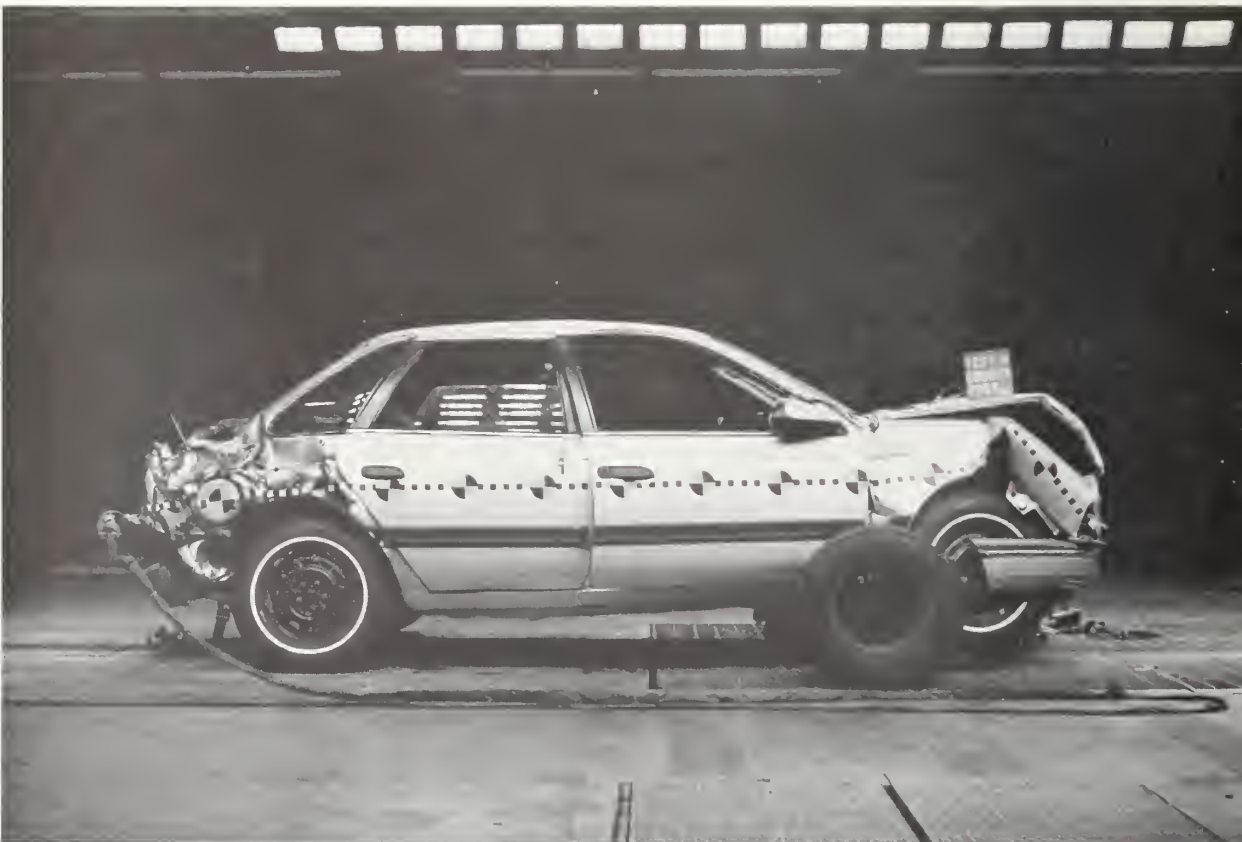


Figure A-4. POST-TEST OVERALL RIGHT SIDE VIEW



Figure A-5. PRE-TEST OVERALL FRONT VIEW



Figure A-6. POST-TEST OVERALL FRONT VIEW



Figure A-7. PRE-TEST LEFT FRONT VIEW



Figure A-8. POST-TEST LEFT FRONT VIEW



Figure A-9. PRE-TEST RIGHT FRONT VIEW



Figure A-10. POST-TEST RIGHT FRONT VIEW

TEST #880823-2
LIST OF PHOTOGRAPHS

11. POST-TEST OVERALL LEFT SIDE VIEW
12. POST-TEST OVERALL RIGHT SIDE VIEW
13. POST-TEST OVERALL FRONT VIEW
14. POST-TEST LEFT FRONT VIEW
15. POST-TEST RIGHT FRONT VIEW
16. POST-TEST CLOSEUP - VIEW 1
17. POST-TEST CLOSEUP - VIEW 2
18. POST-TEST CLOSEUP - VIEW 3
19. POST-TEST CLOSEUP - VIEW 4
20. POST-TEST CLOSEUP - VIEW 5
21. POST-TEST CLOSEUP - VIEW 6
22. POST-TEST CLOSEUP - VIEW 7
23. POST-TEST CLOSEUP - VIEW 8



Figure A-11. POST-TEST OVERALL LEFT SIDE VIEW



Figure A-12. POST-TEST OVERALL RIGHT SIDE VIEW

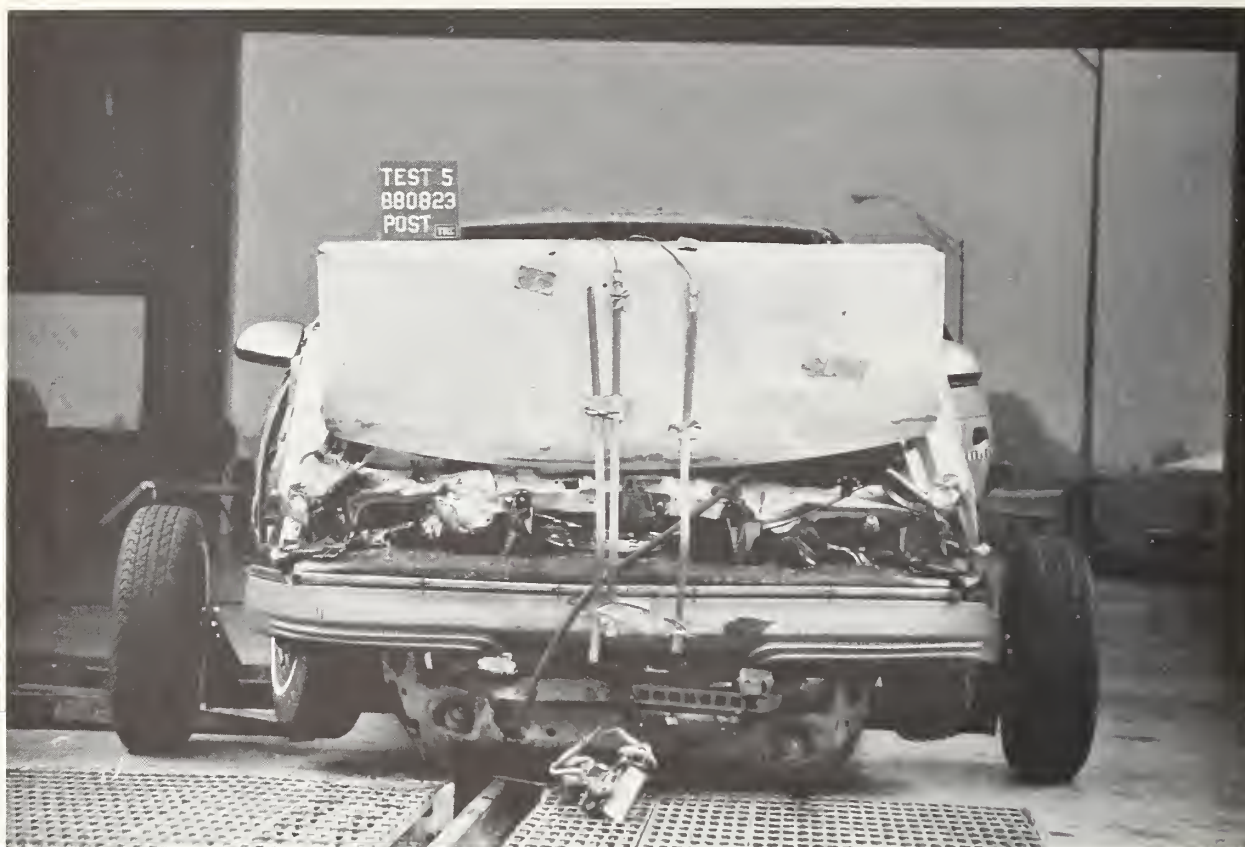


Figure A-13. POST-TEST OVERALL FRONT VIEW



Figure A-14. POST-TEST LEFT FRONT VIEW



Figure A-15. POST-TEST RIGHT FRONT VIEW

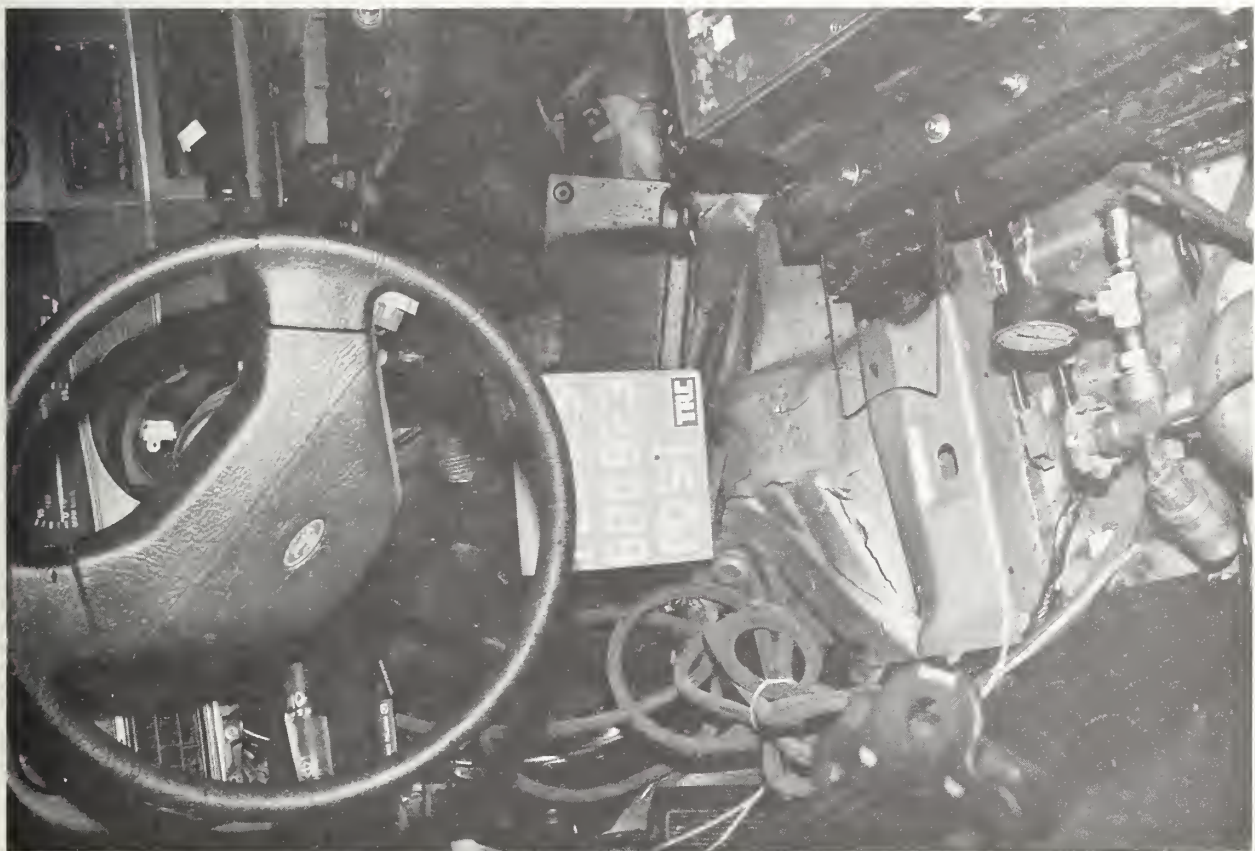


Figure A-16. POST-TEST CLOSEUP - VIEW 1

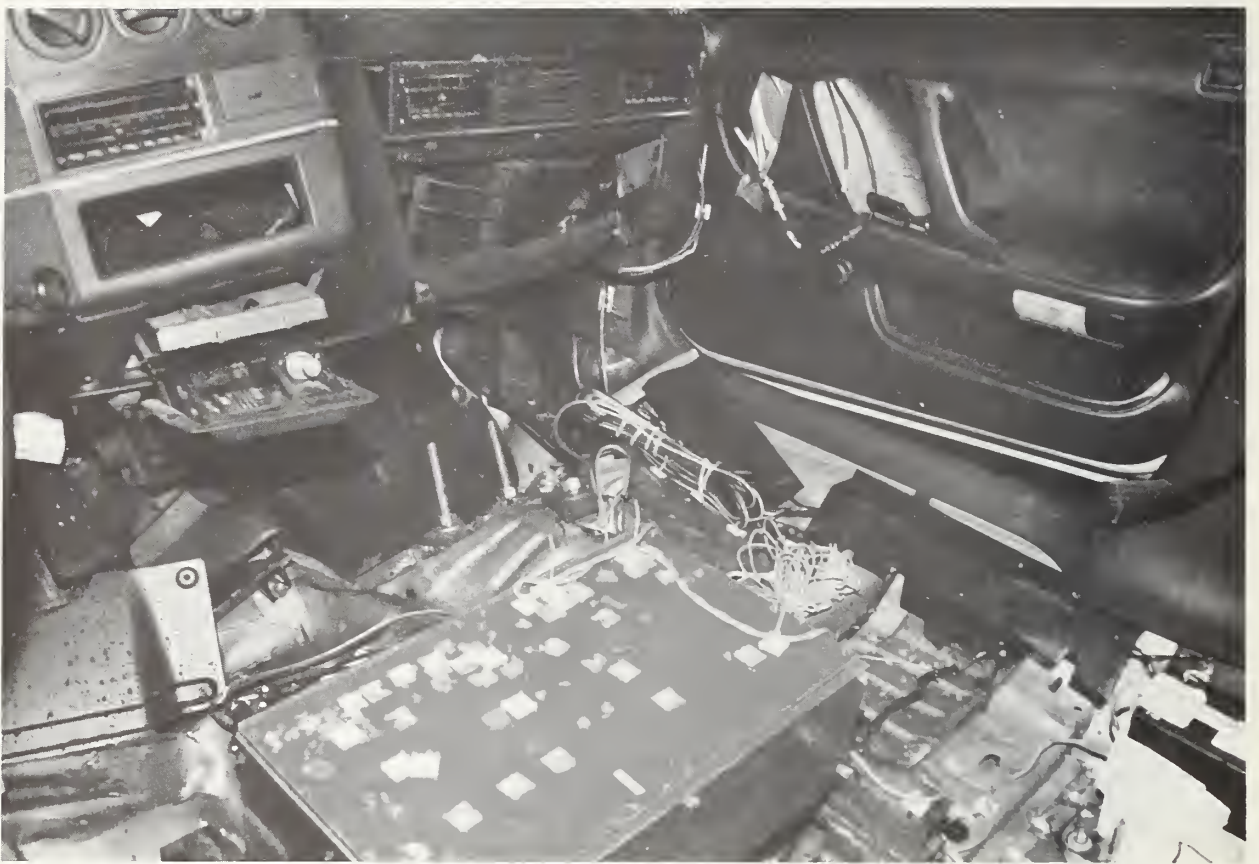


Figure A-17. POST-TEST CLOSEUP - VIEW 2

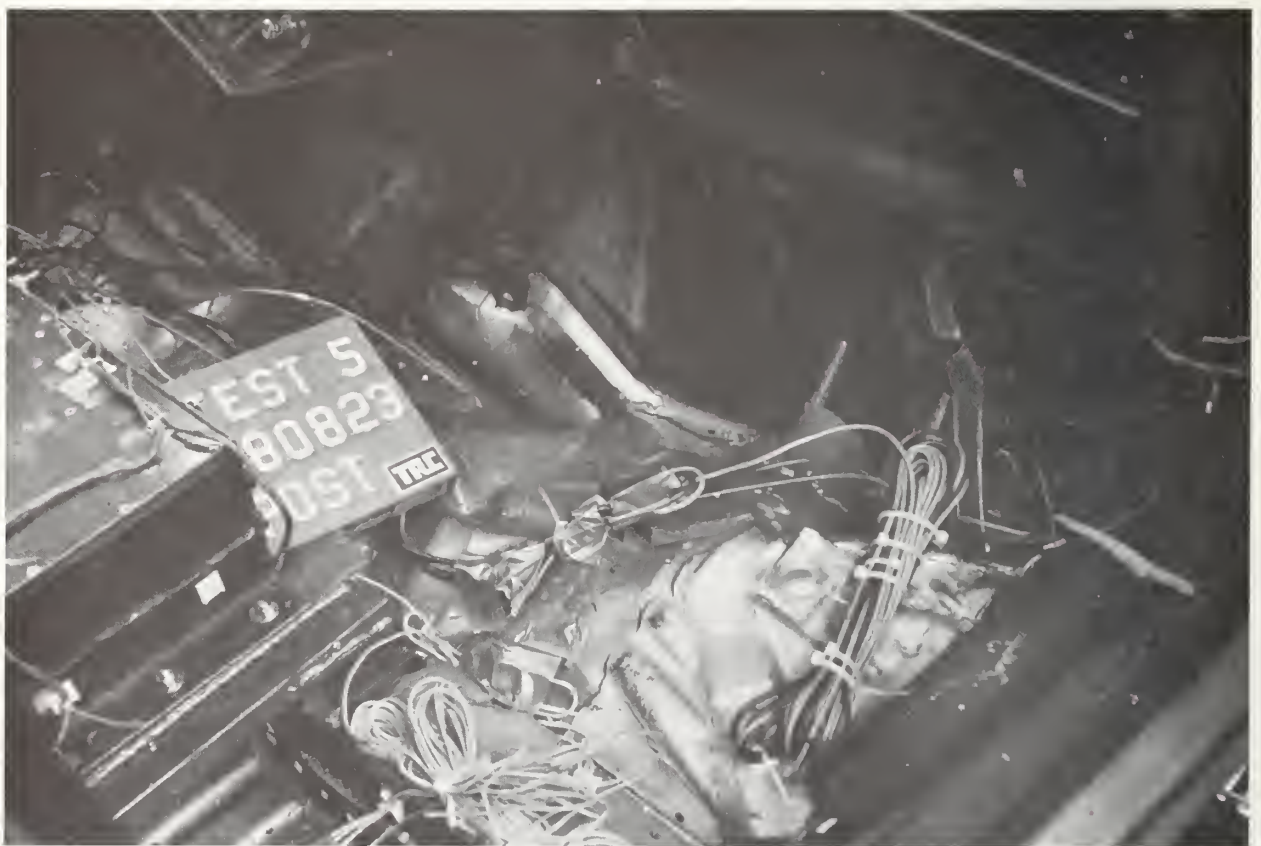


Figure A-18. POST-TEST CLOSEUP - VIEW 3

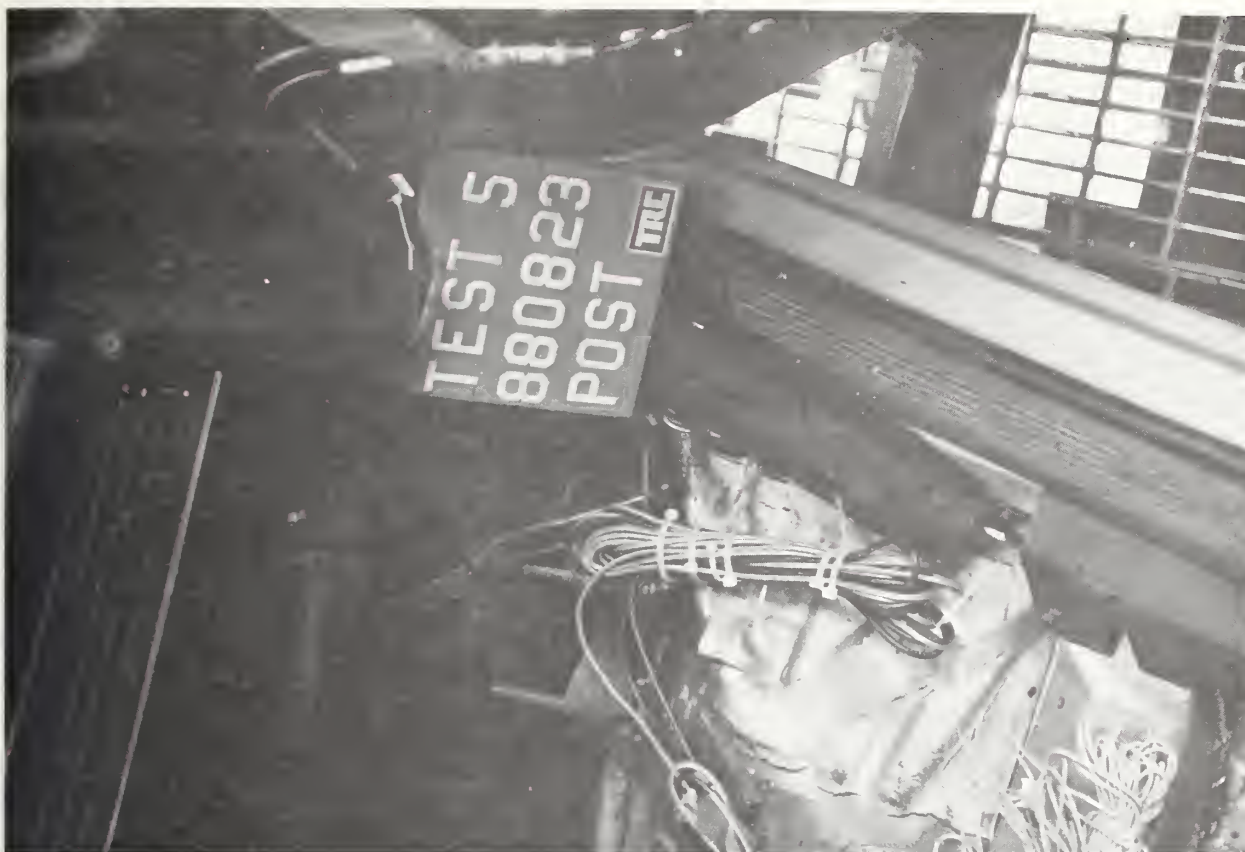


Figure A-19. POST-TEST CLOSEUP - VIEW 4



Figure A-20. POST-TEST CLOSEUP - VIEW 5



Figure A-21. POST-TEST CLOSEUP - VIEW 6



Figure A-22. POST-TEST CLOSEUP - VIEW 7

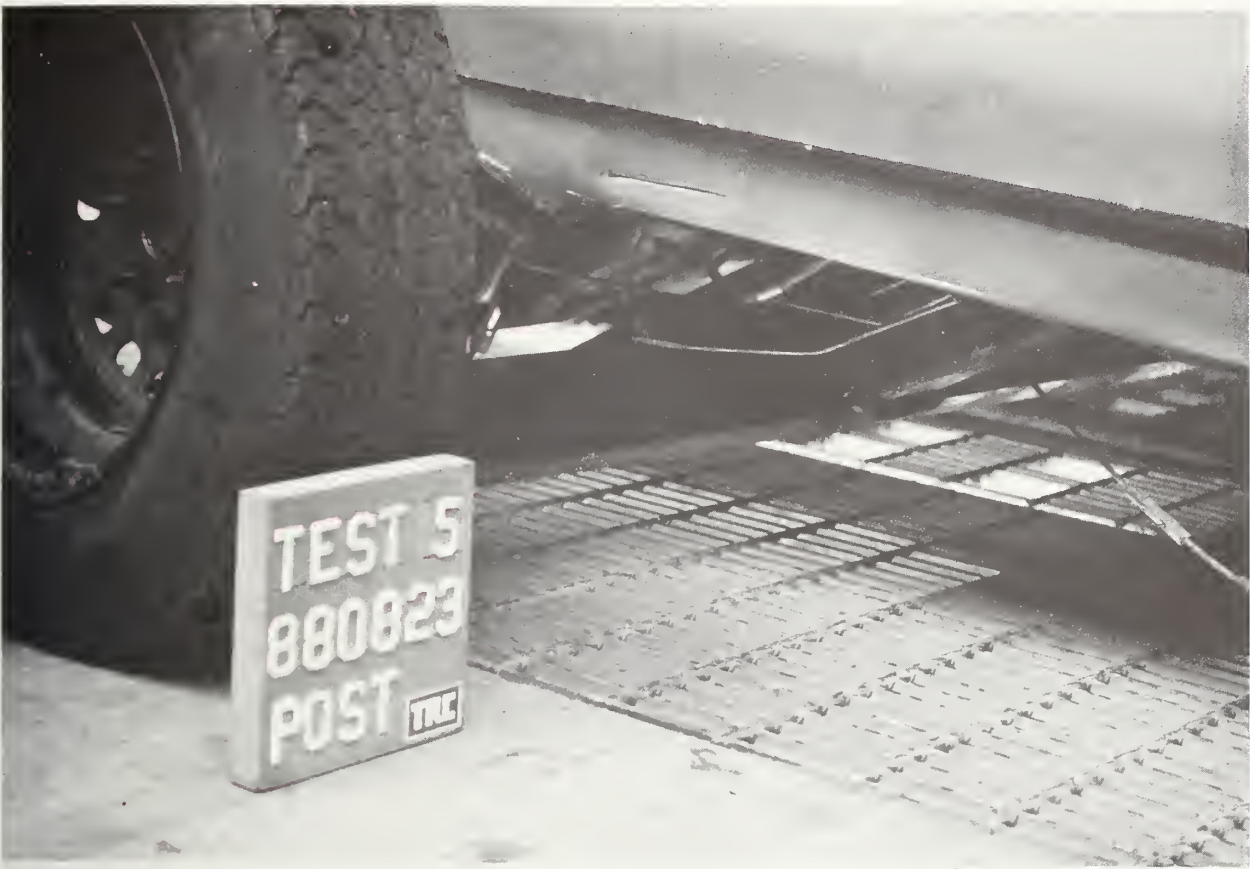


Figure A-23. POST-TEST CLOSEUP - VIEW 8

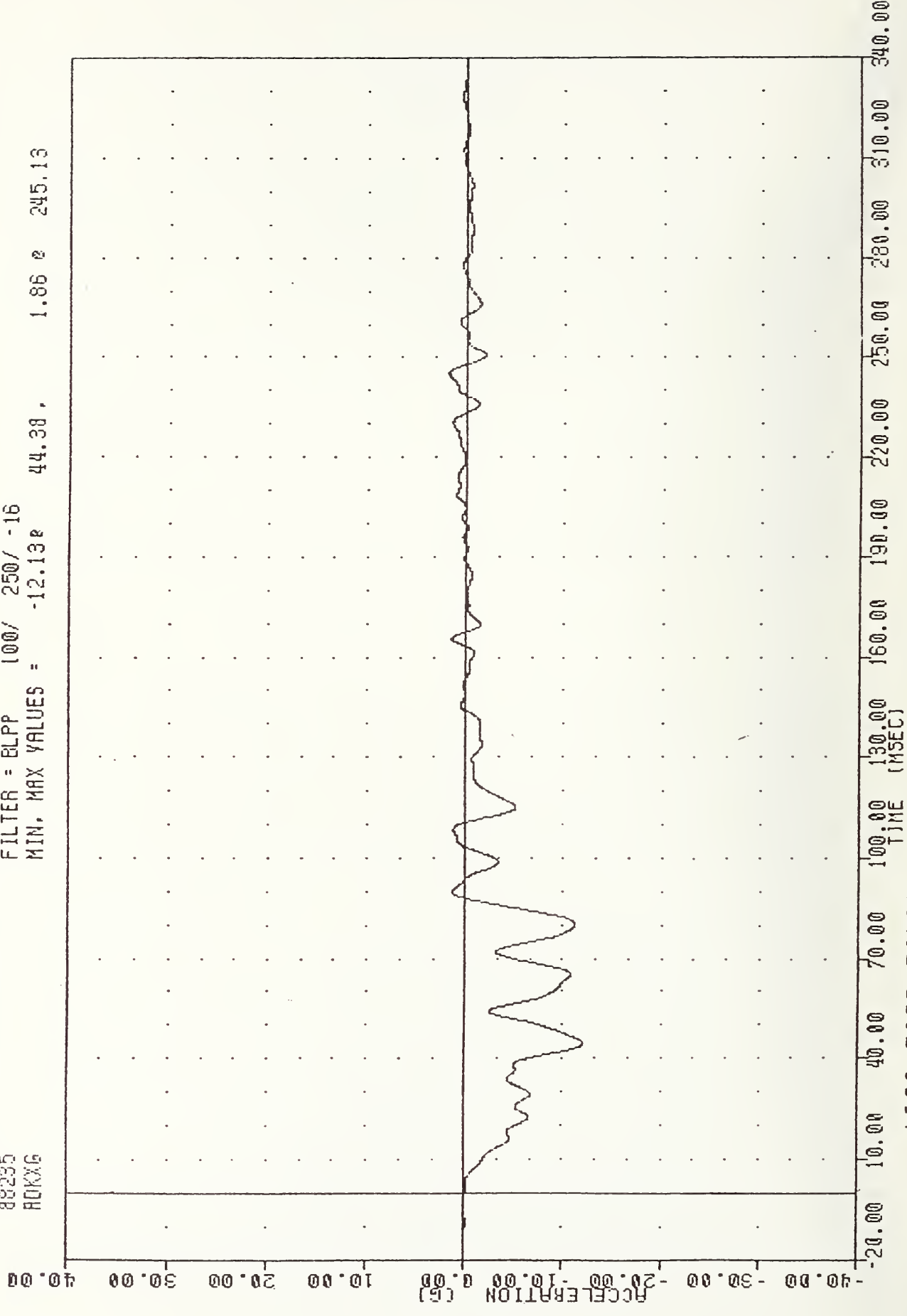
APPENDIX B
DATA PLOTS

WRTC-1 , 880822
DAMAGE ALGORITHM REFORMULATION

88235
ADKXG

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -12.13e 44.38 ,

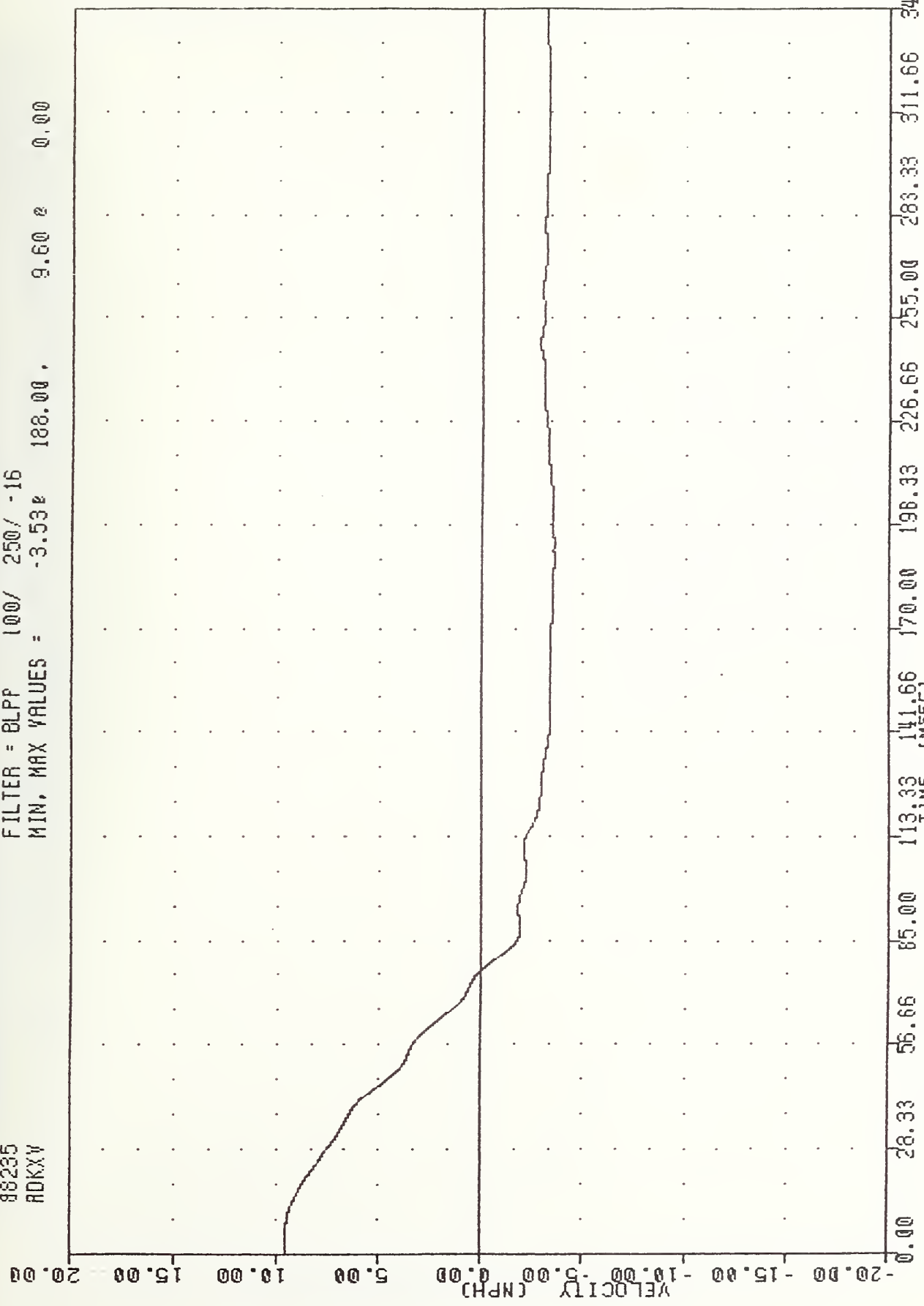
1.86 e 245.13



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 10 MPH FIRST TEST
VEHICLE REAR DECK X AXIS ACCELERATION

VRTC-1 , 880822
DAMAGE ALGORITHM REFORMULATION
88235
RDKXW

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -3.53E 188.00 , 9.60 E 0.00



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 10 MPH FIRST TEST
VEHICLE REAR DECK X AXIS VELOCITY

VRIC-1
DAMAGE ALGORITHM REFORMULATION

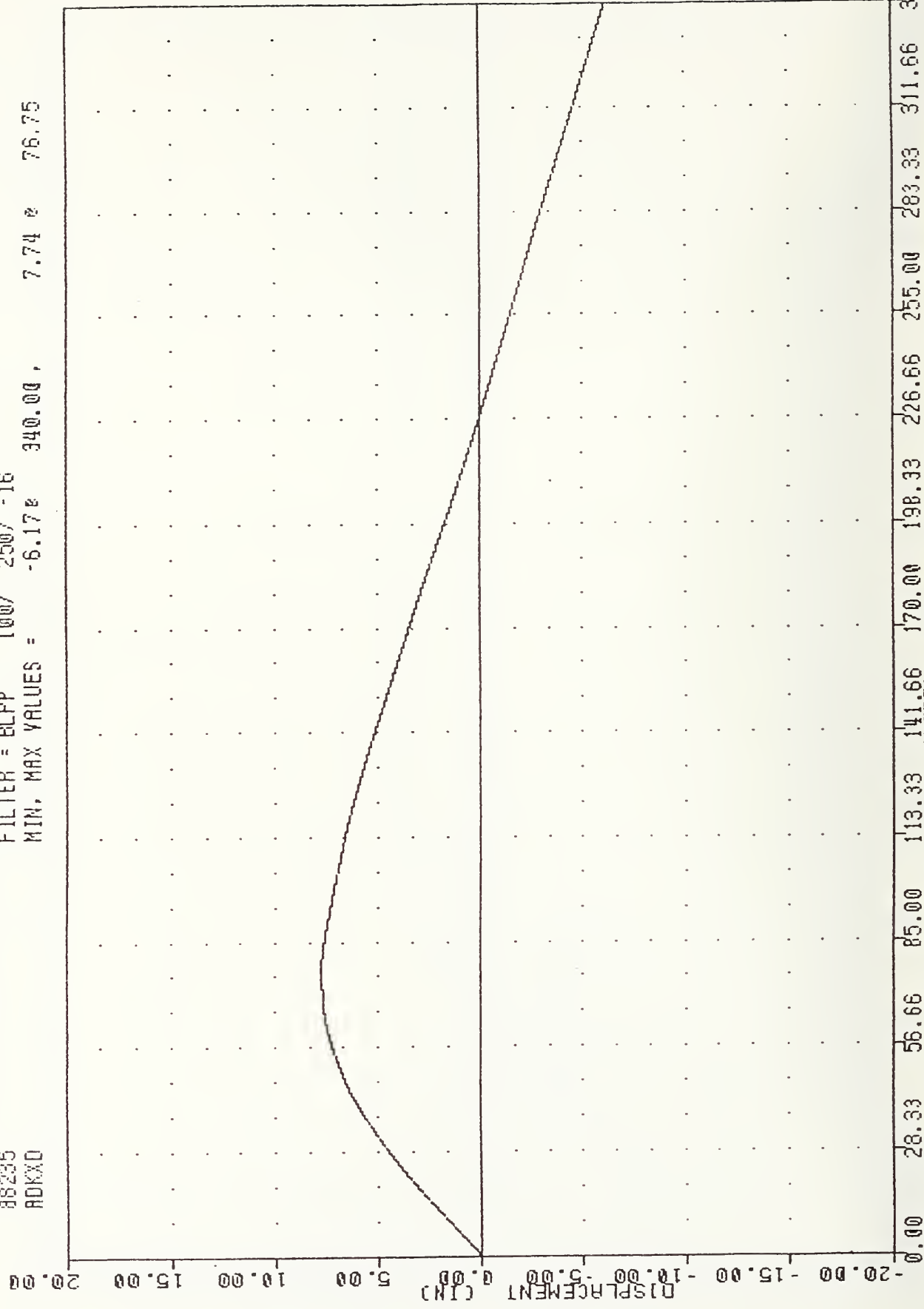
88235

ADKXD

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -6.17e 340.00,

7.74 e 76.75



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 10 MPH FIRST TEST
VEHICLE REAR DECK X AXIS DISPLACEMENT

VRTC-1, 880822

DAMAGE ALGORITHM REFORMULATION

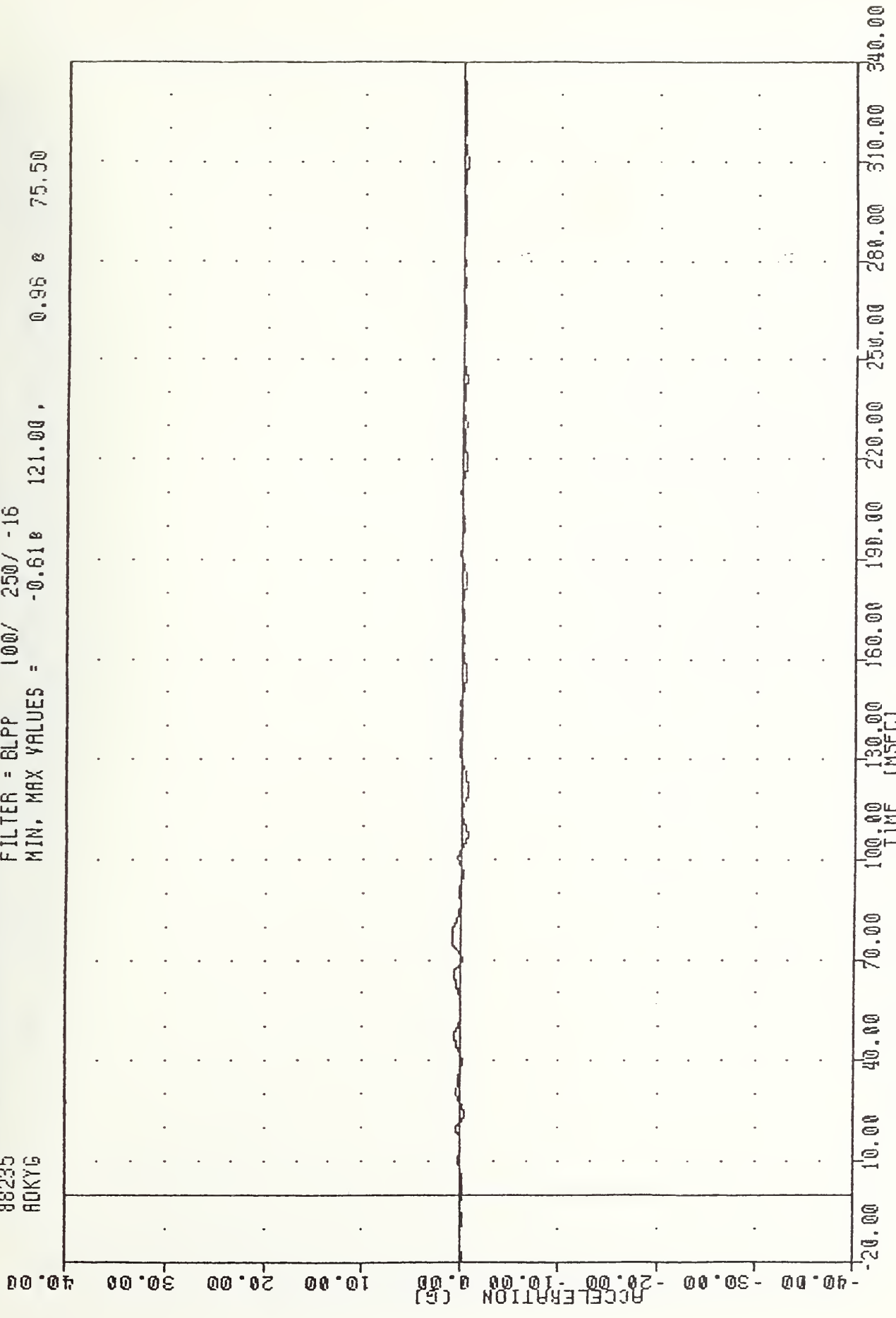
88235

ADKYG

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -0.618 121.00,

0.96 8 75.50



VRTC-1 , 880822

DAMAGE ALGORITHM REFORMULATION

88235

ADK16

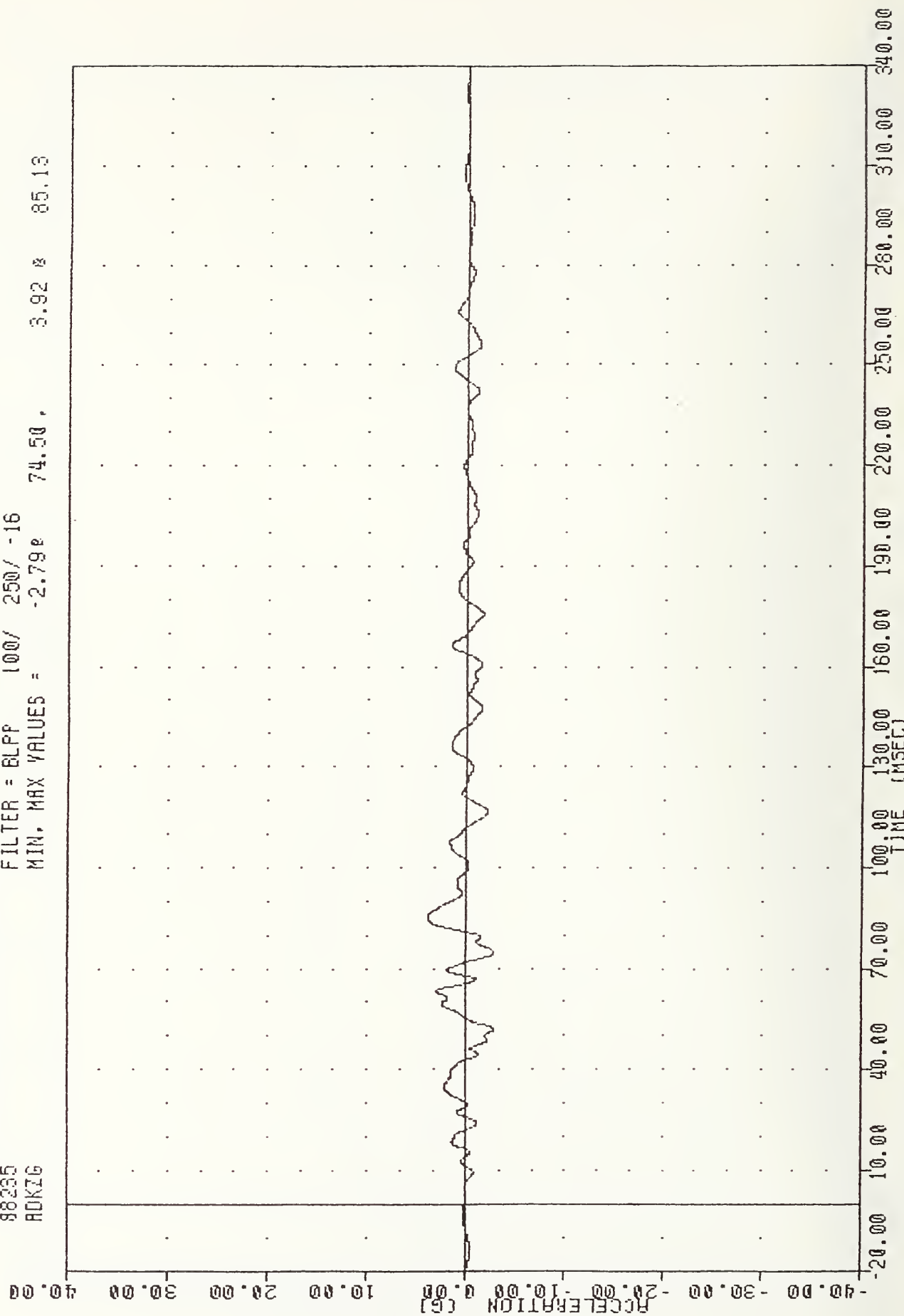
FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES =

74.50 ,

3.92 &

85.13

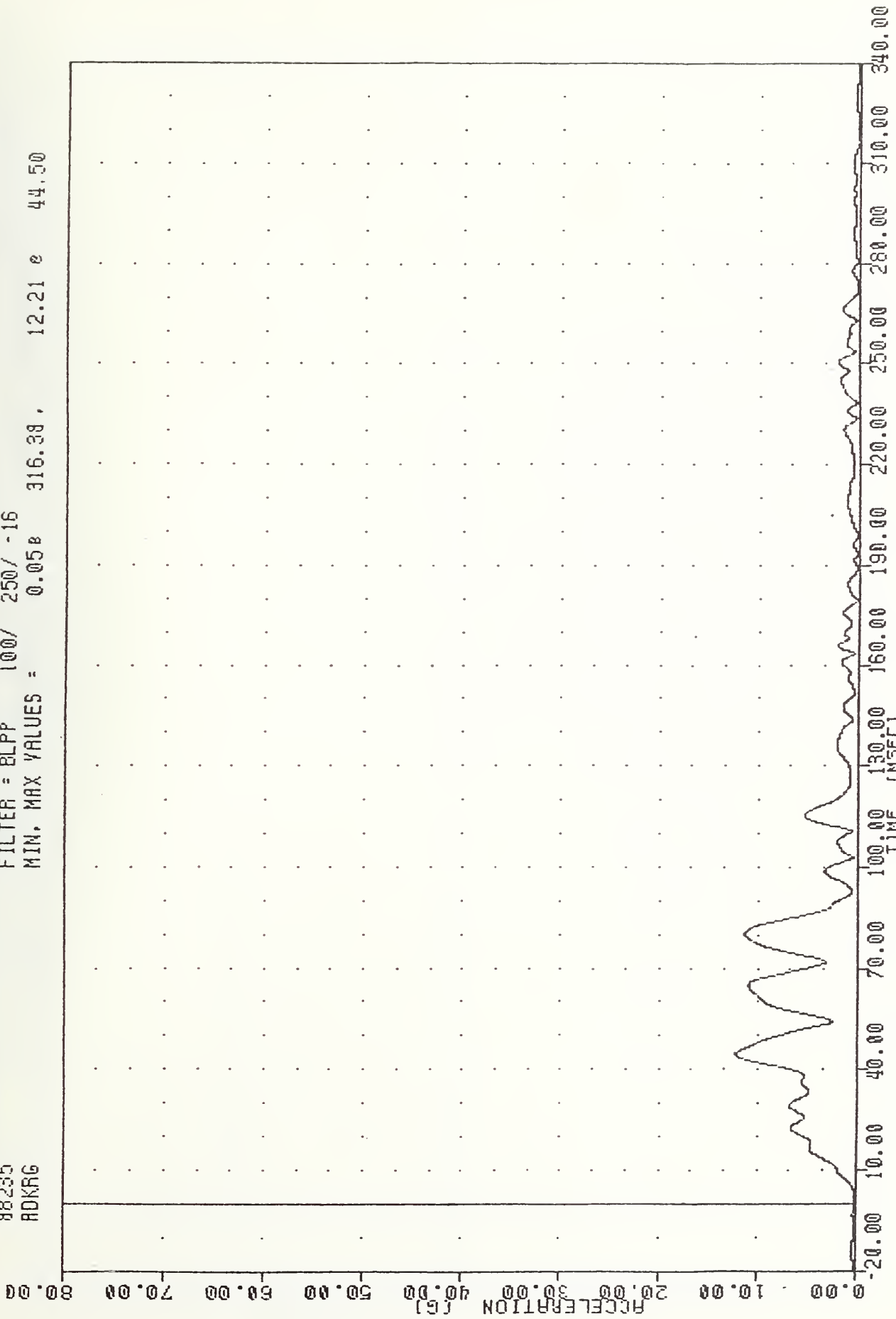


1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 10 MPH FIRST TEST
VEHICLE REAR DECK Z AXIS ACCELERATION

VRTC-1 , 880822
DAMAGE ALGORITHM REFORMULATION

88235 FILTER = BLPP 100/ 250/ -16

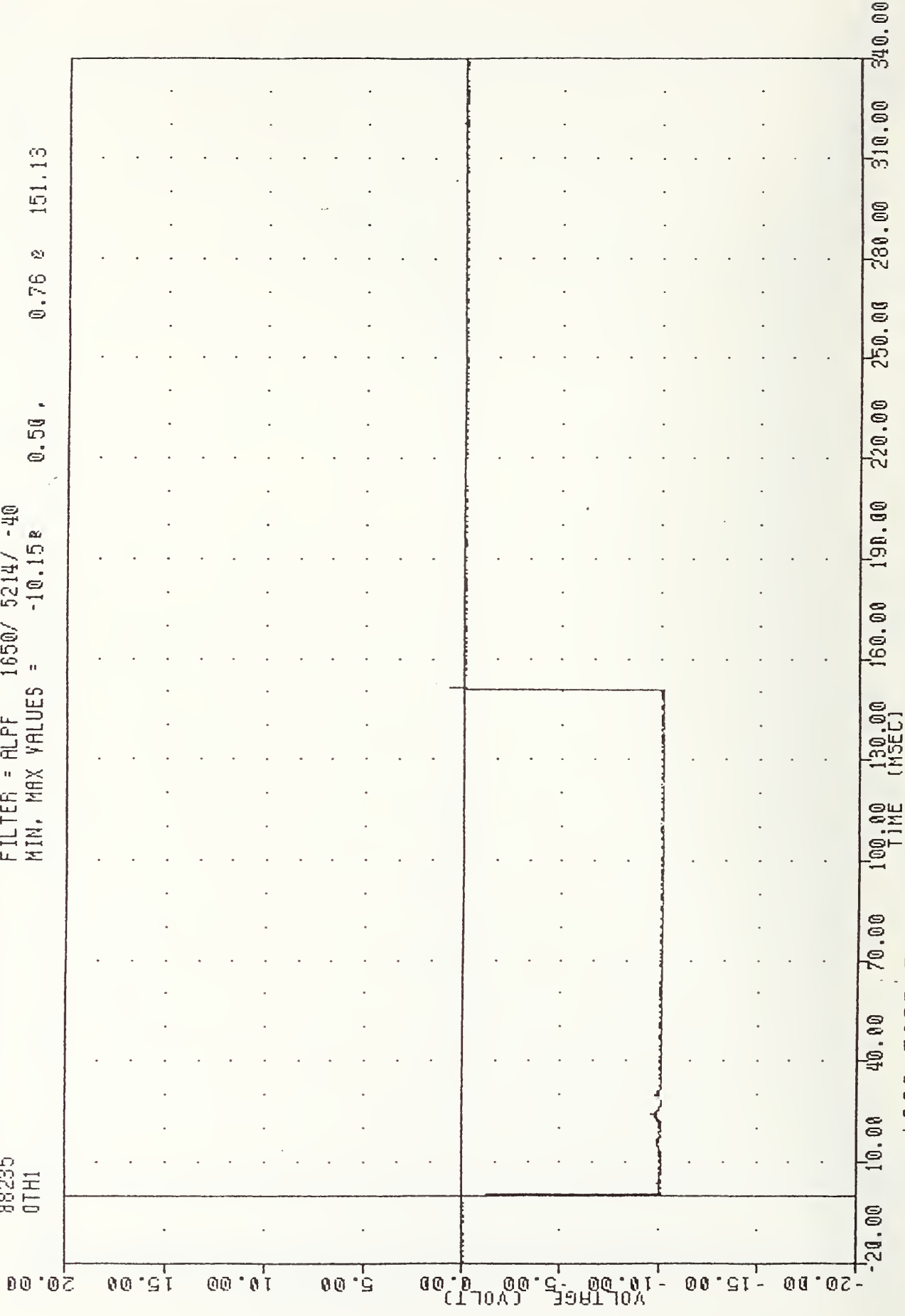
ADKRG MIN, MAX VALUES = 0.058 316.38 , 12.21 e 44.50



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 10 MPH FIRST TEST
VEHICLE REAR DECK RESULTANT ACCELERATION

VRTC-1 , 880822
DAMAGE ALGORITHM REFORMULATION

88235 FILTER = ALPF 1650/ 5214/ -40
0TH1 MIN, MAX VALUES = -10.158 0.50 , 0.76 2 151.13



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 10 MPH FIRST TEST
CONTACT SWITCH

VRTC-1 , 880822

DAMAGE ALGORITHM REFORMULATION

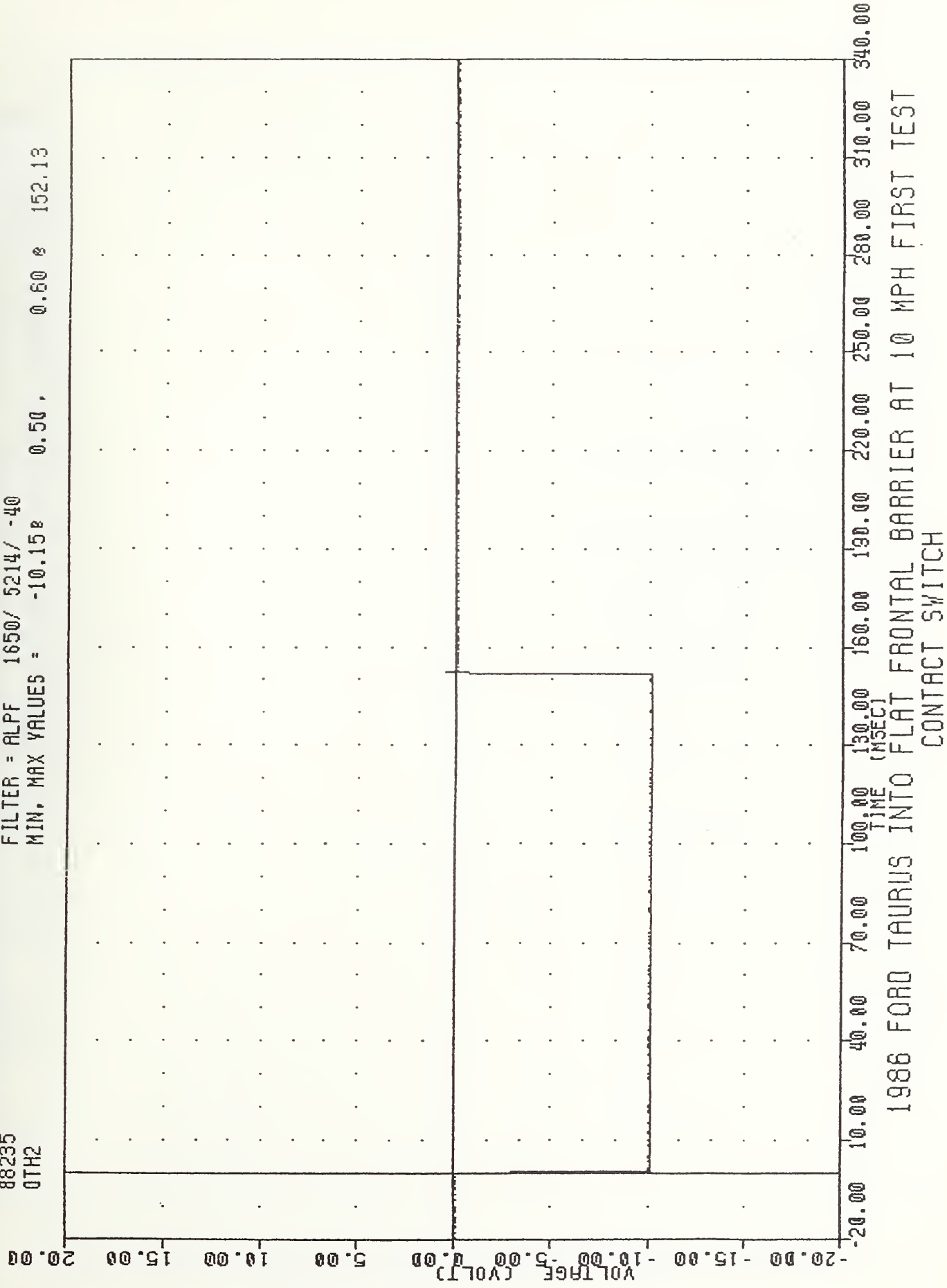
88235

OTH2

FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = -10.15e

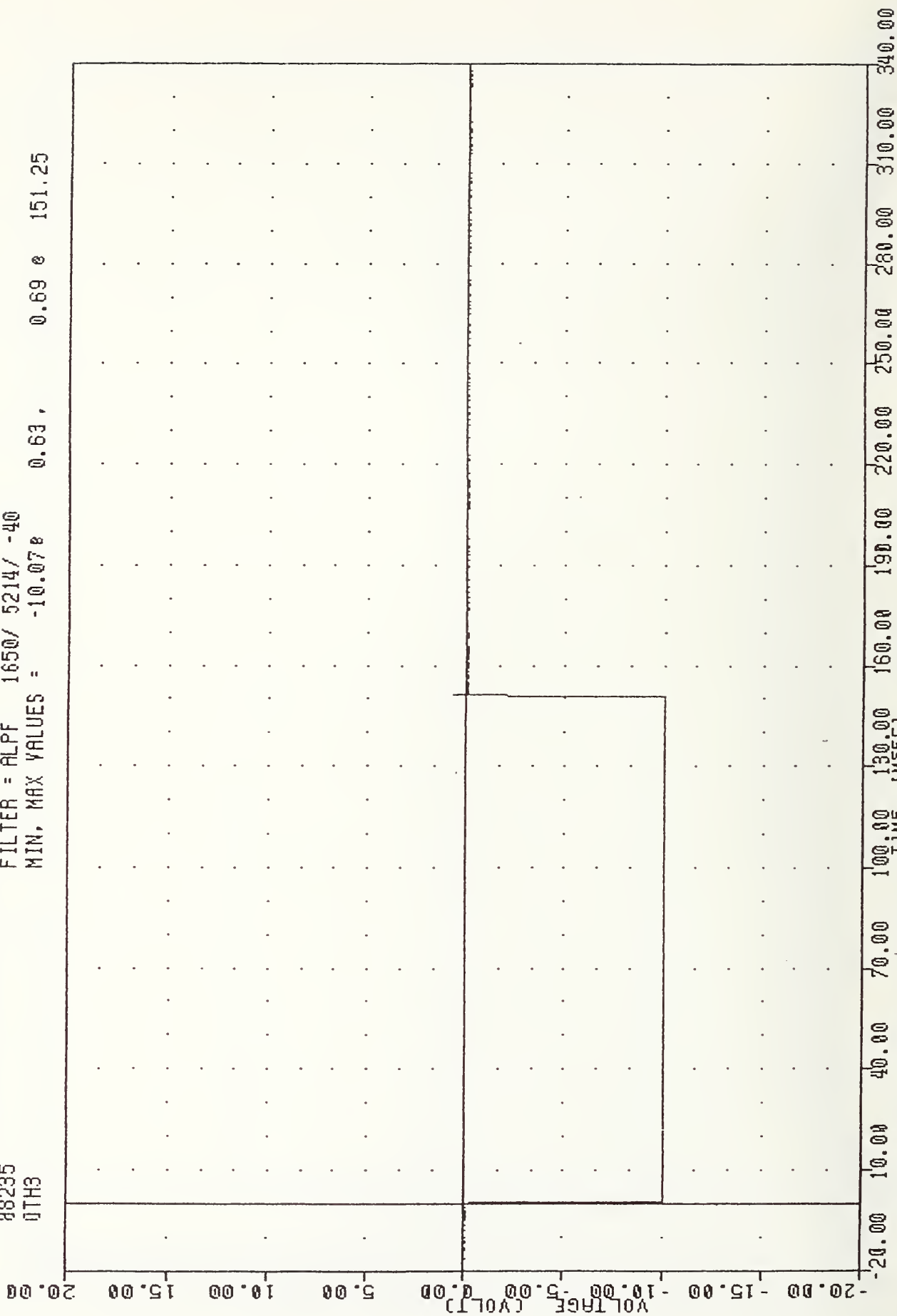
0.50 , 0.60 e 152.13



VRTC-1 , 880822
 DAMAGE ALGORITHM REFORMULATION

88235 FILTER = ALPF 1650/ 5214/ -40

QTH3 MIN, MAX VALUES = -10.07e 0.63, 0.69 e 151.25



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 10 MPH FIRST TEST
 CONTACT SWITCH

YRTC-2 , 880822

DAMAGE ALGORITHM REFORMULATION

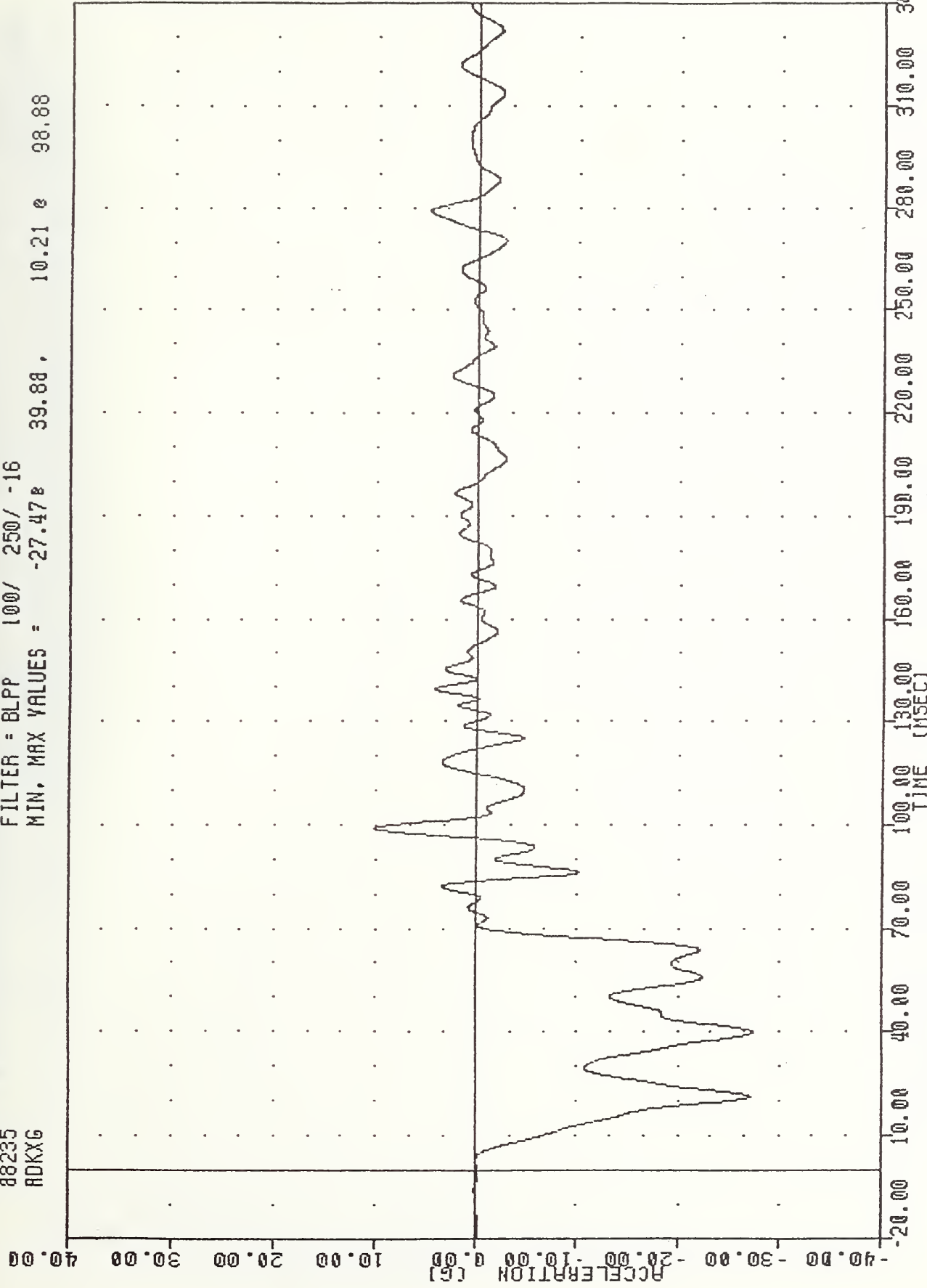
88235

ADKXG

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -27.47 39.88 ,

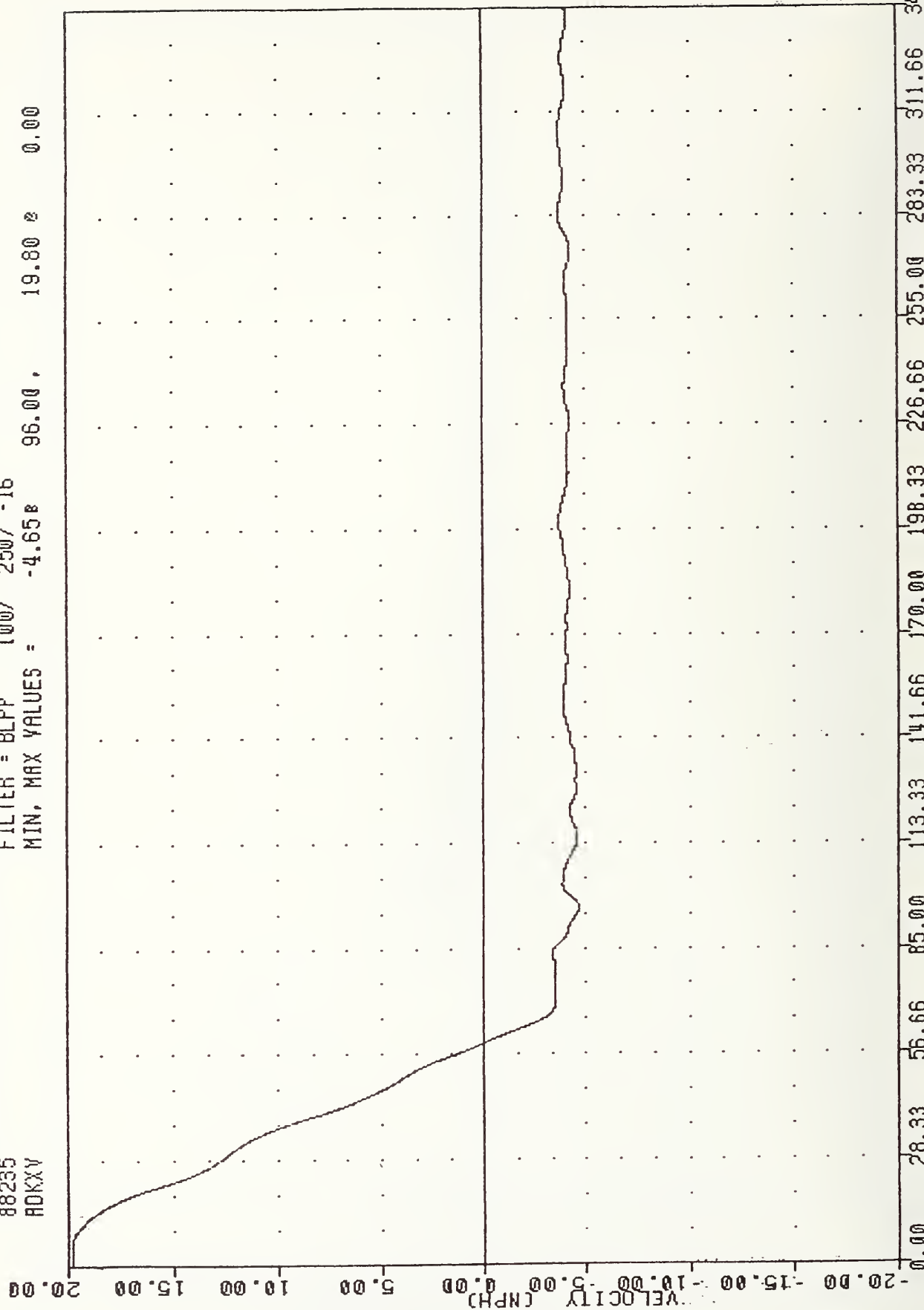
10.21 98.88



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH SECOND TEST
VEHICLE REAR DECK X AXIS ACCELERATION

VRTC-2 , 880822
 DAMAGE ALGORITHM REFORMULATION
 88235
 ADKXY

FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -4.65 96.00 , 19.80 0.00



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH SECOND TEST
 VEHICLE REAR DECK X AXIS VELOCITY

VRTC-2 , 880822

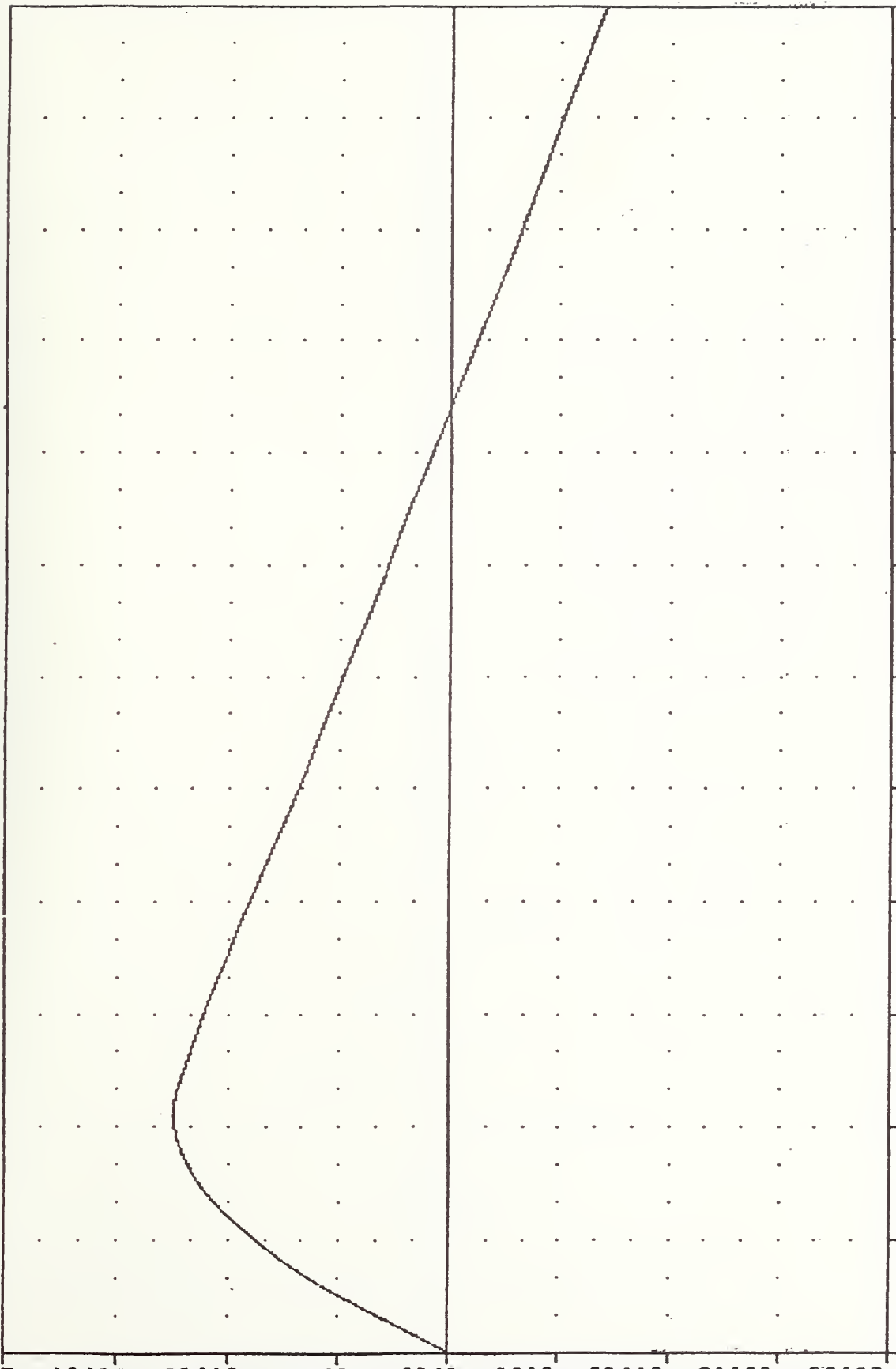
DAMAGE ALGORITHM REFORMULATION

88235

ADKXD

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -7.06 340.00 , 12.43 59.75

DISPLACEMENT (IN)



0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00

1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH SECOND TEST
VEHICLE REAR DECK X AXIS DISPLACEMENT

VRTC-2 , 880822

DAMAGE ALGORITHM REFORMULATION

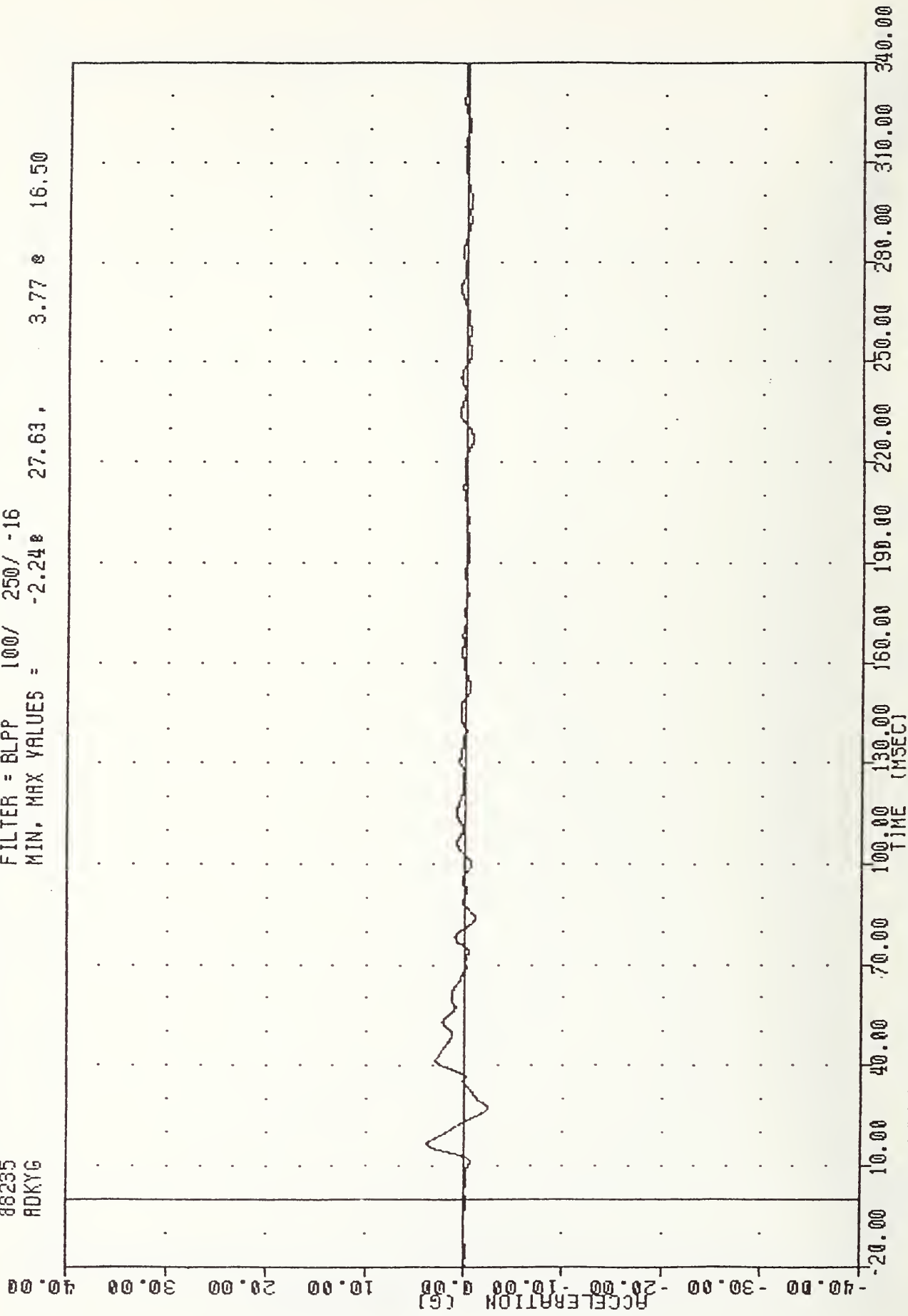
88235

ADKYG

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -2.24 27.63 ,

3.77 16.50



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH SECOND TEST
VEHICLE REAR DECK Y AXIS ACCELERATION

VRTC-2 , 880822

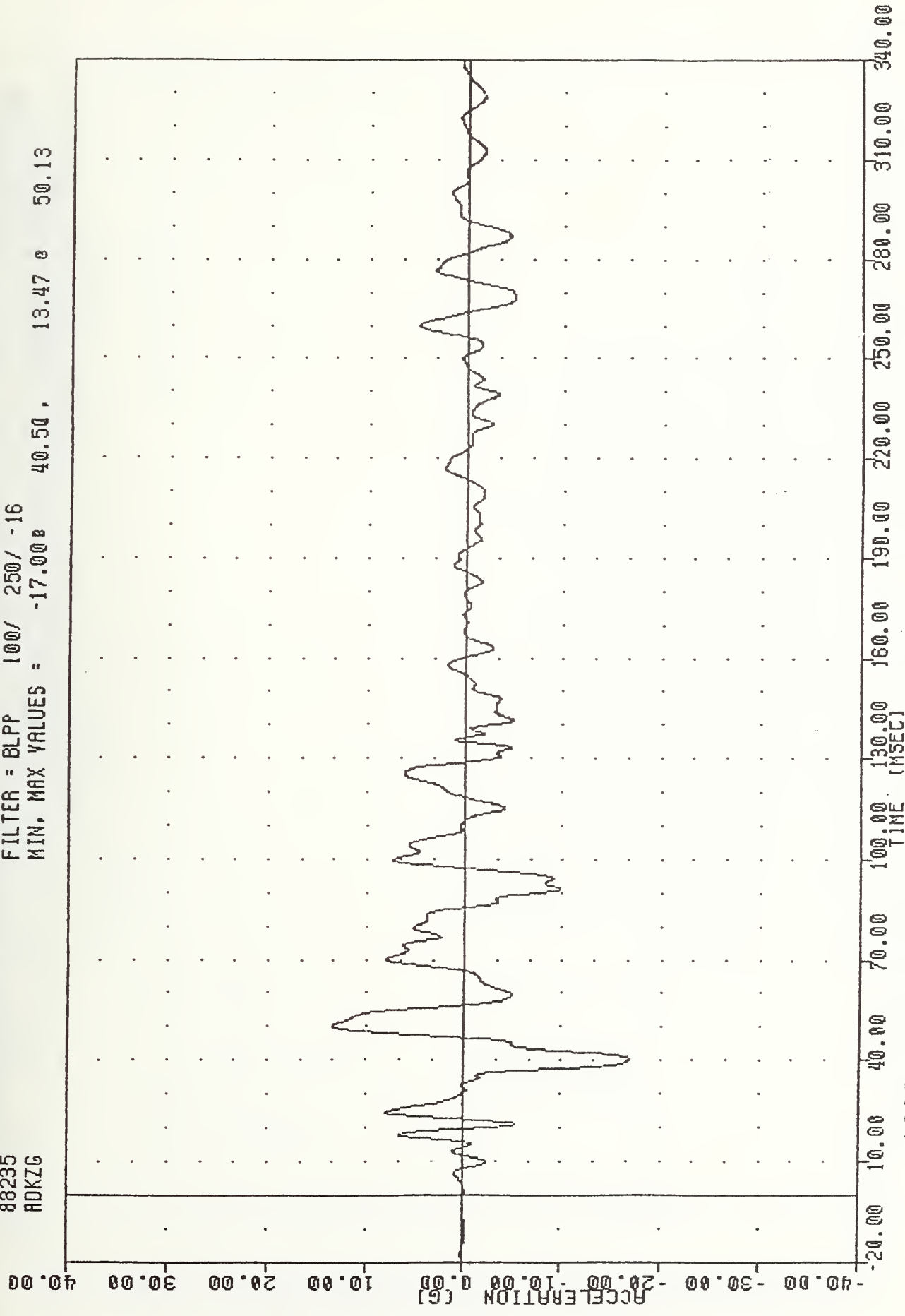
DAMAGE ALGORITHM REFORMULATION

88235

ADKZG

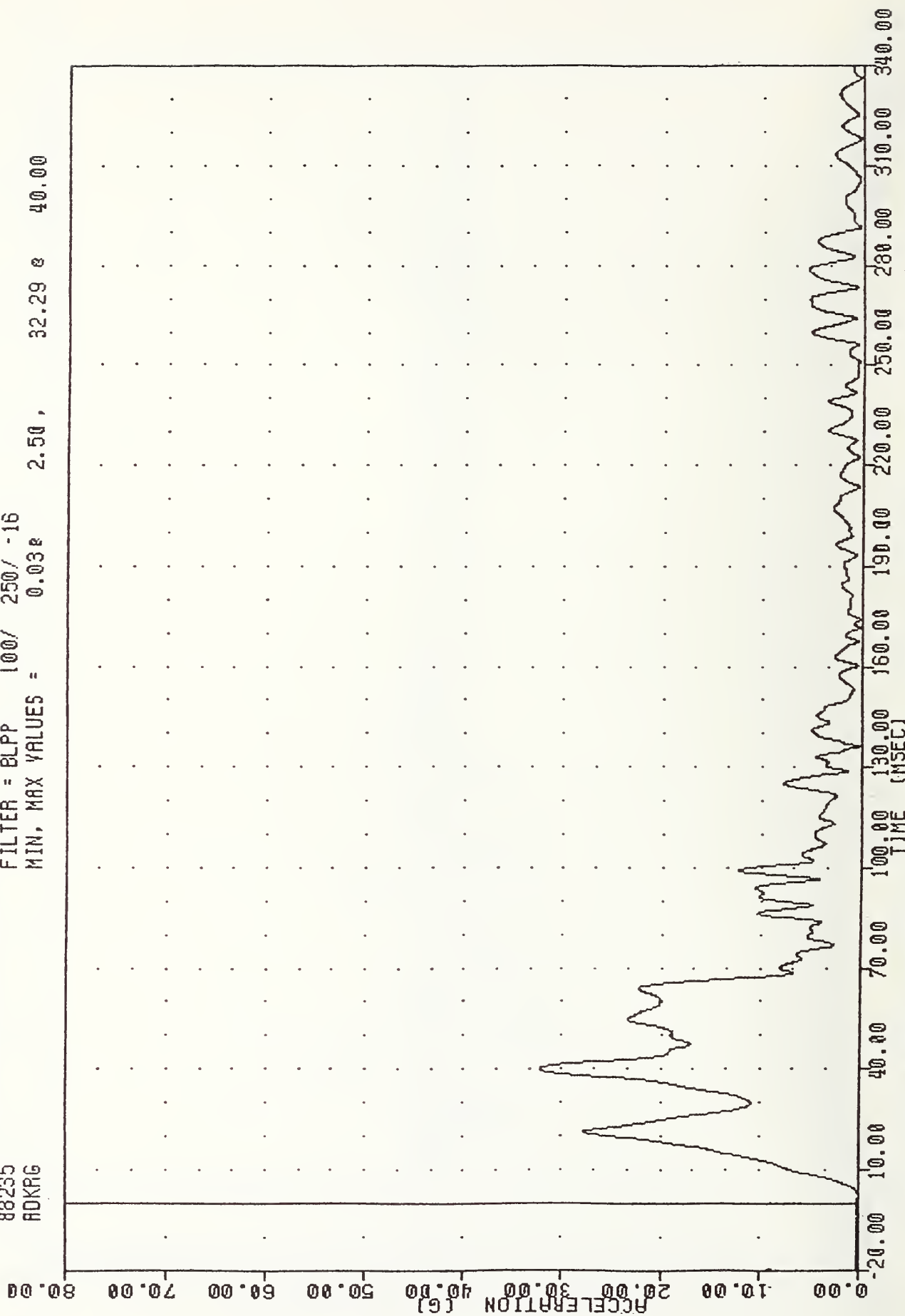
FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -17.00g 40.50 , 13.47 g 50.13



VRTC-2 , 880822
DAMAGE ALGORITHM REFORMULATION

88235
ADKRG
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = 0.038 2.50 , 32.29 & 40.00



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH SECOND TEST
VEHICLE REAR DECK RESULTANT ACCELERATION

VRTC-2 , 880822

DAMAGE ALGORITHM REFORMULATION

88235

0TH1

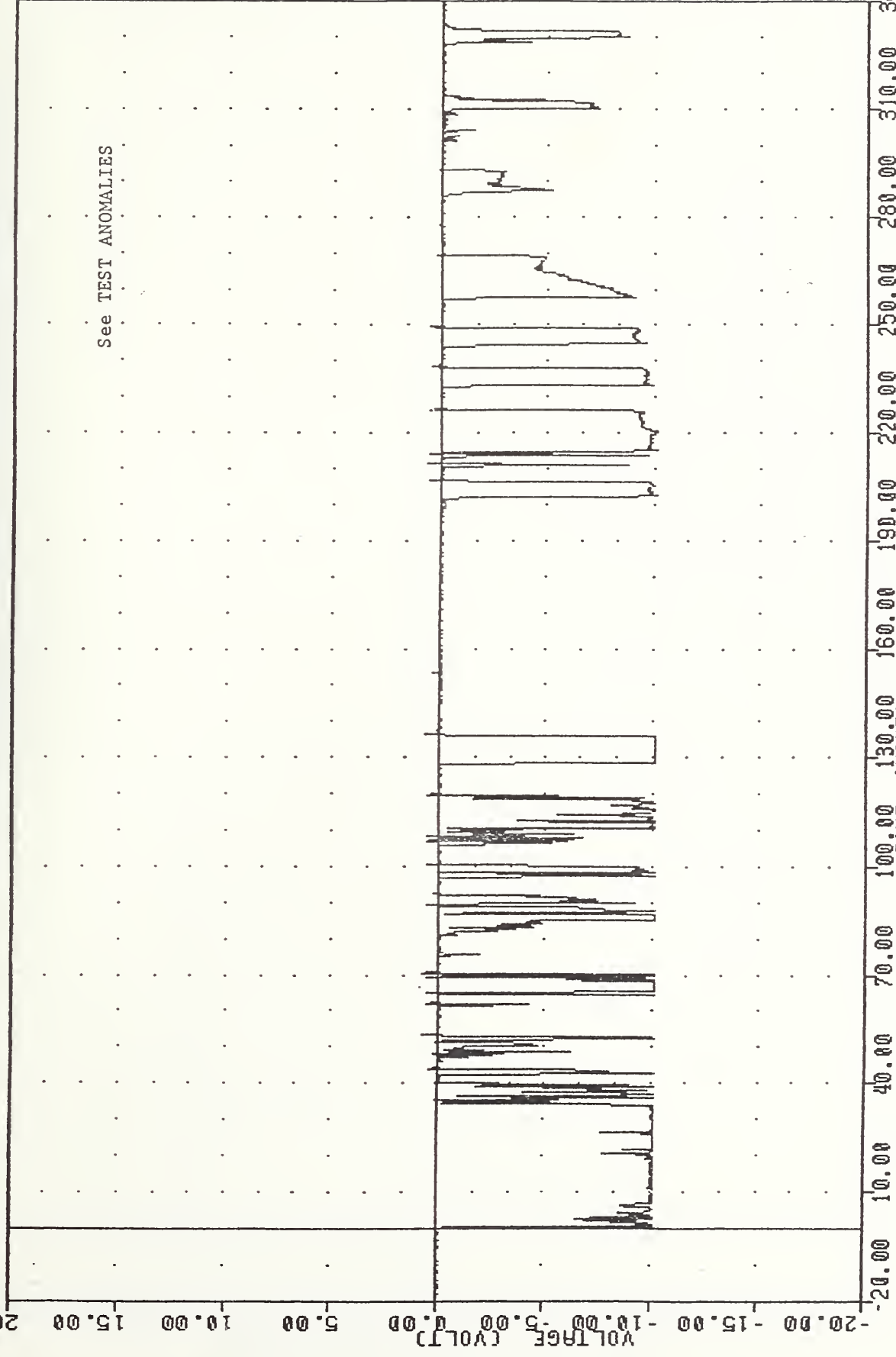
FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = -10.15

0.63,

0.82

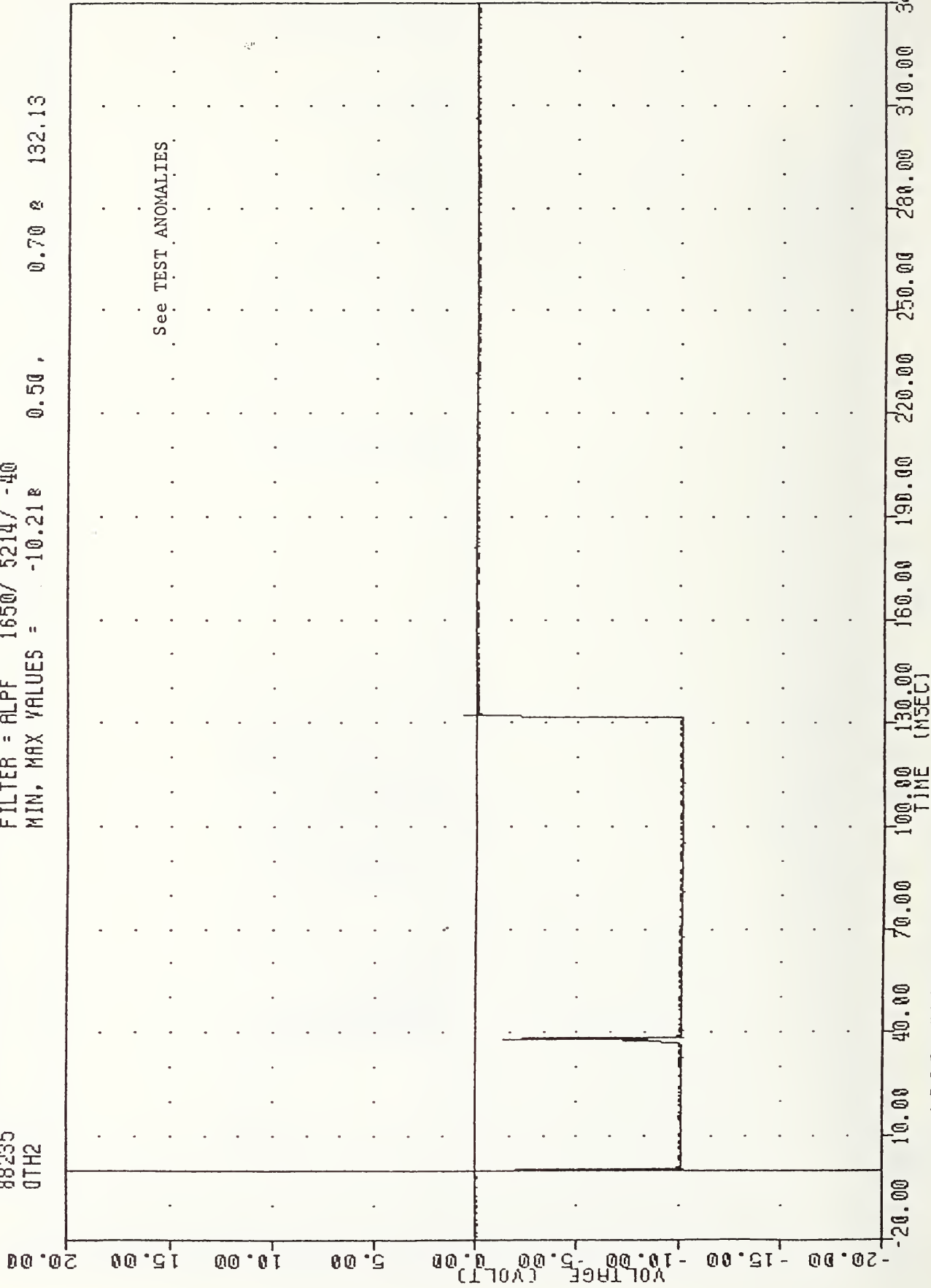
70.50



1986 FORD TAURUS INTO
FLAT FRONTAL BARRIER AT 20 MPH SECOND TEST
CONTACT SWITCH

VRTC-2 , 880822
DAMAGE ALGORITHM REFORMULATION

88235 FILTER = ALPF 1650/ 5214/ -40
0TH2 MIN, MAX VALUES = -10.218 0.50 , 0.70 & 132.13



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH SECOND TEST
CONTACT SWITCH

VRTC-2 , 880822

DAMAGE ALGORITHM REFORMULATION

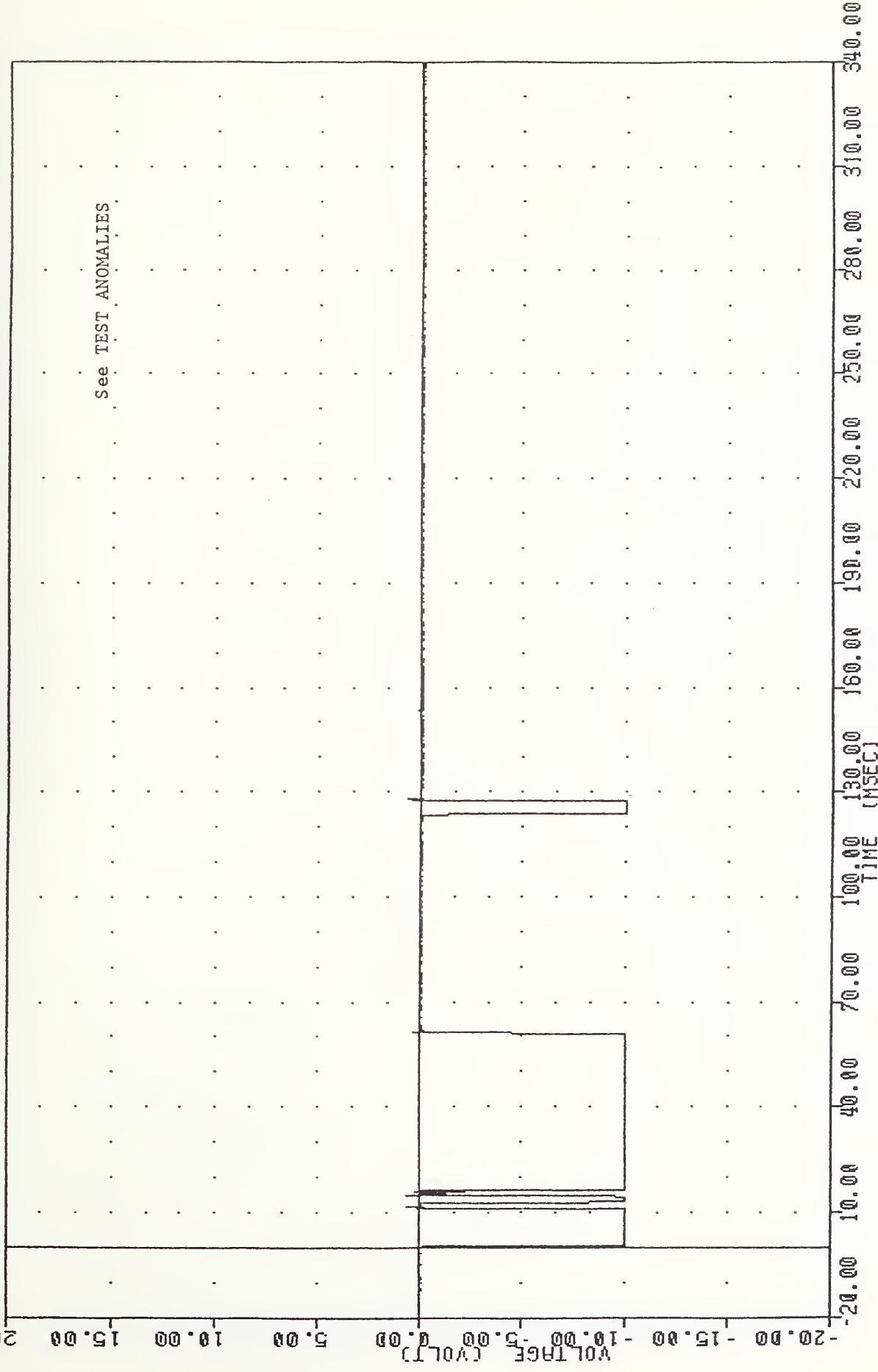
88235

0TH3

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -10.008

0.63 , 0.66 e 14.88



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH SECOND TEST

CONTACT SWITCH

VRTC-3, 880822
DAMAGE ALGORITHM REFORMULATION

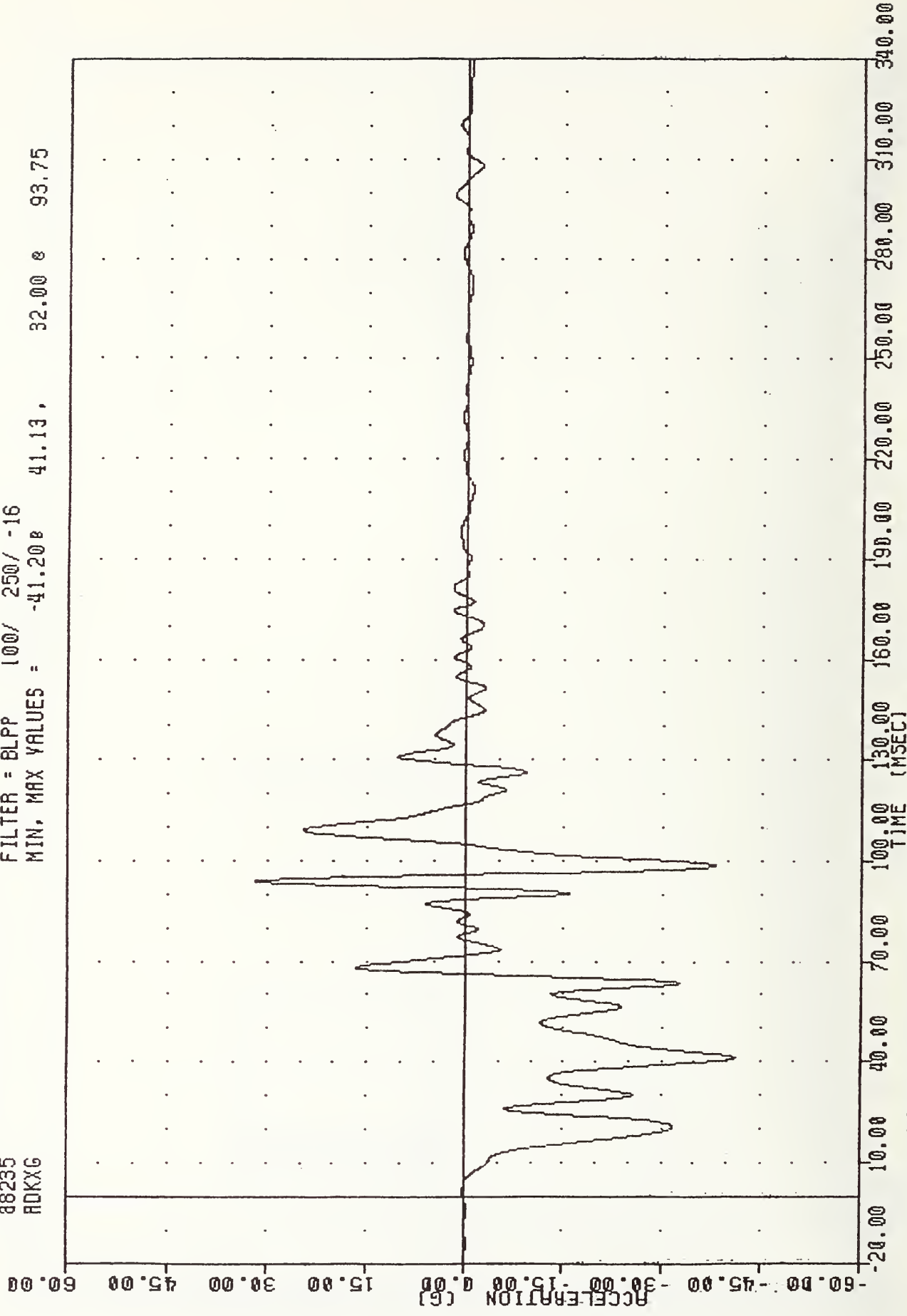
88235

ADKXG

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -41.20g

41.13, 32.00 g 93.75



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH THIRD TEST
VEHICLE REAR DECK X AXIS ACCELERATION

VRTC-3 , 880822

DAMAGE ALGORITHM REFORMULATION

88235

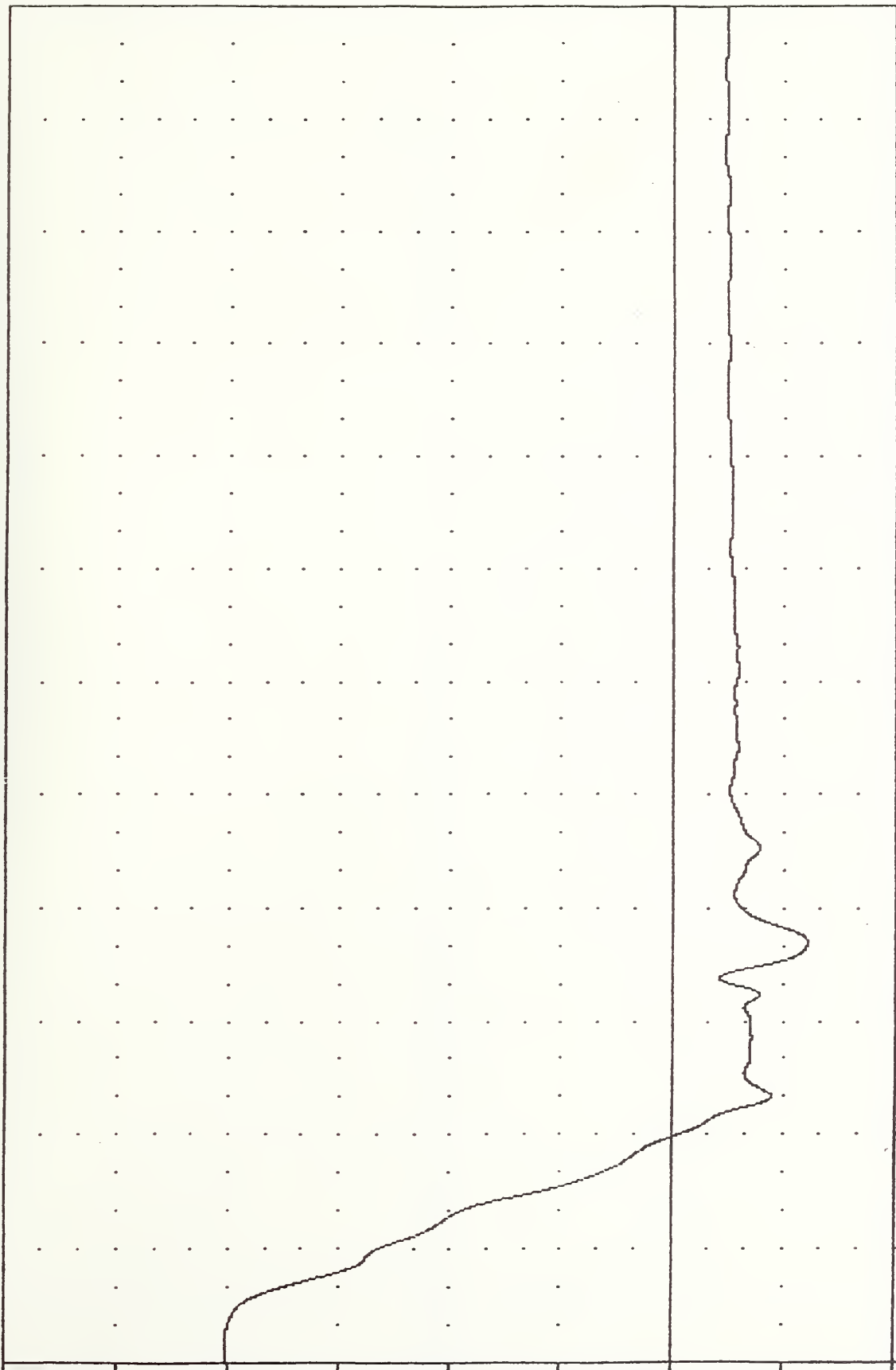
RDKXY

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -6.08 104.75 ,

20.12 8 4.75

30.00
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00

VELOCITY (MPH)



0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00

1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH THIRD TEST
VEHICLE REAR DECK X AXIS VELOCITY

VRTC-3 , 880822
DAMAGE ALGORITHM REFORMULATION

88235
ADKXD

FILTER = BLPP 100/ 250/ -16

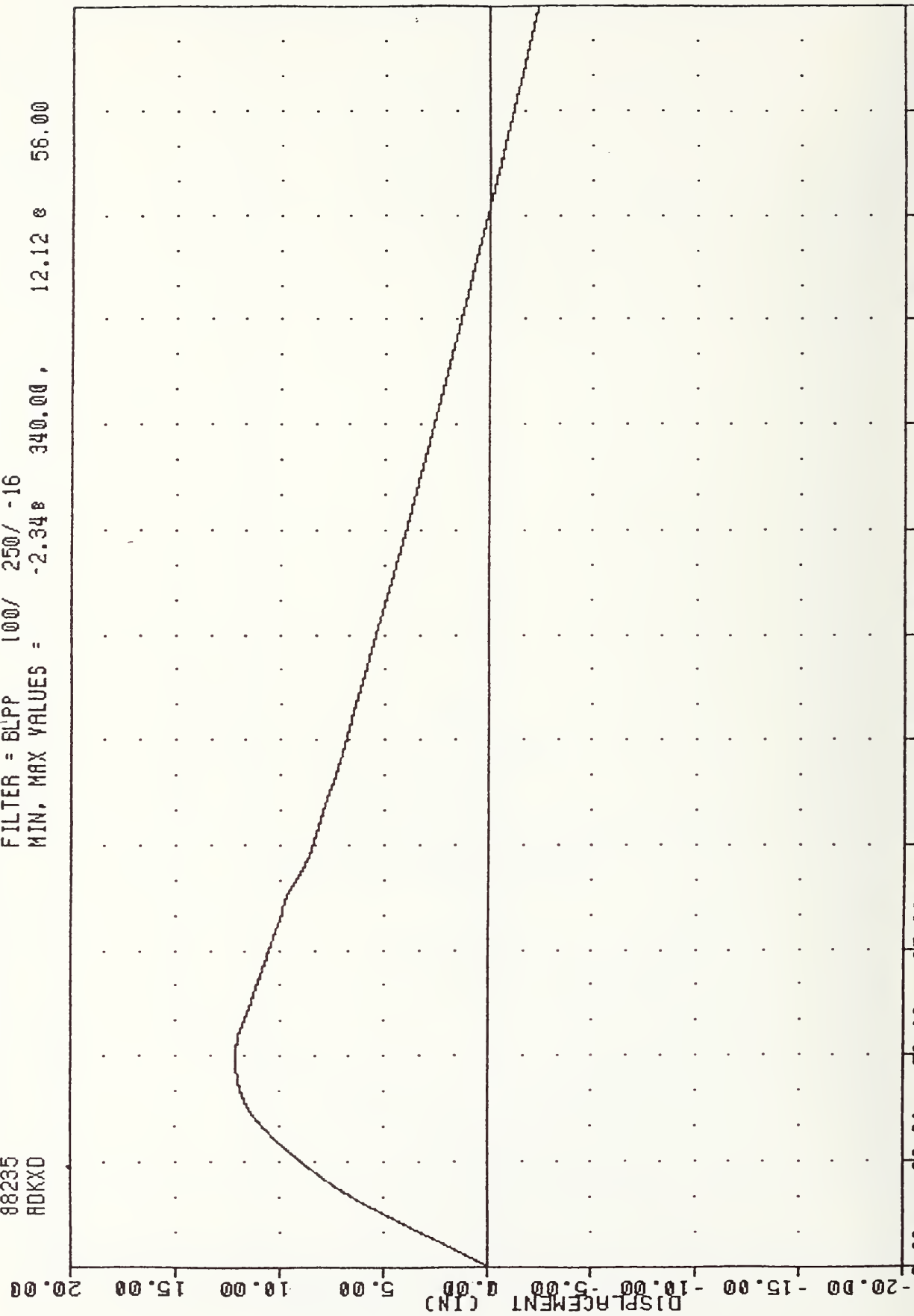
MIN, MAX VALUES =

-2.34E

340.00,

12.12 E

56.00

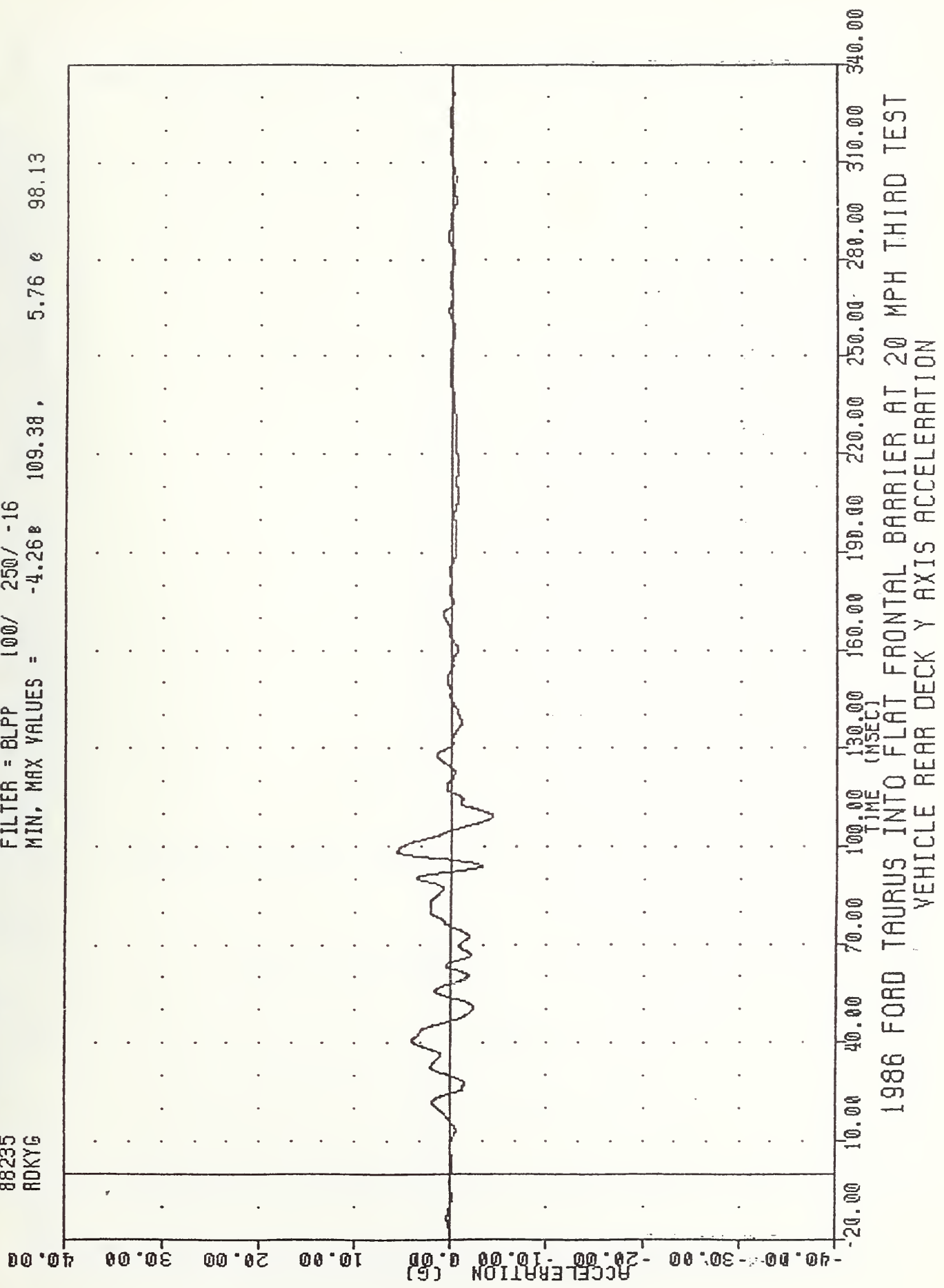


0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00

1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH THIRD TEST
VEHICLE REAR DECK X AXIS DISPLACEMENT

VRTC-3 , 880822
DAMAGE ALGORITHM REFORMULATION
88235
ADKYG

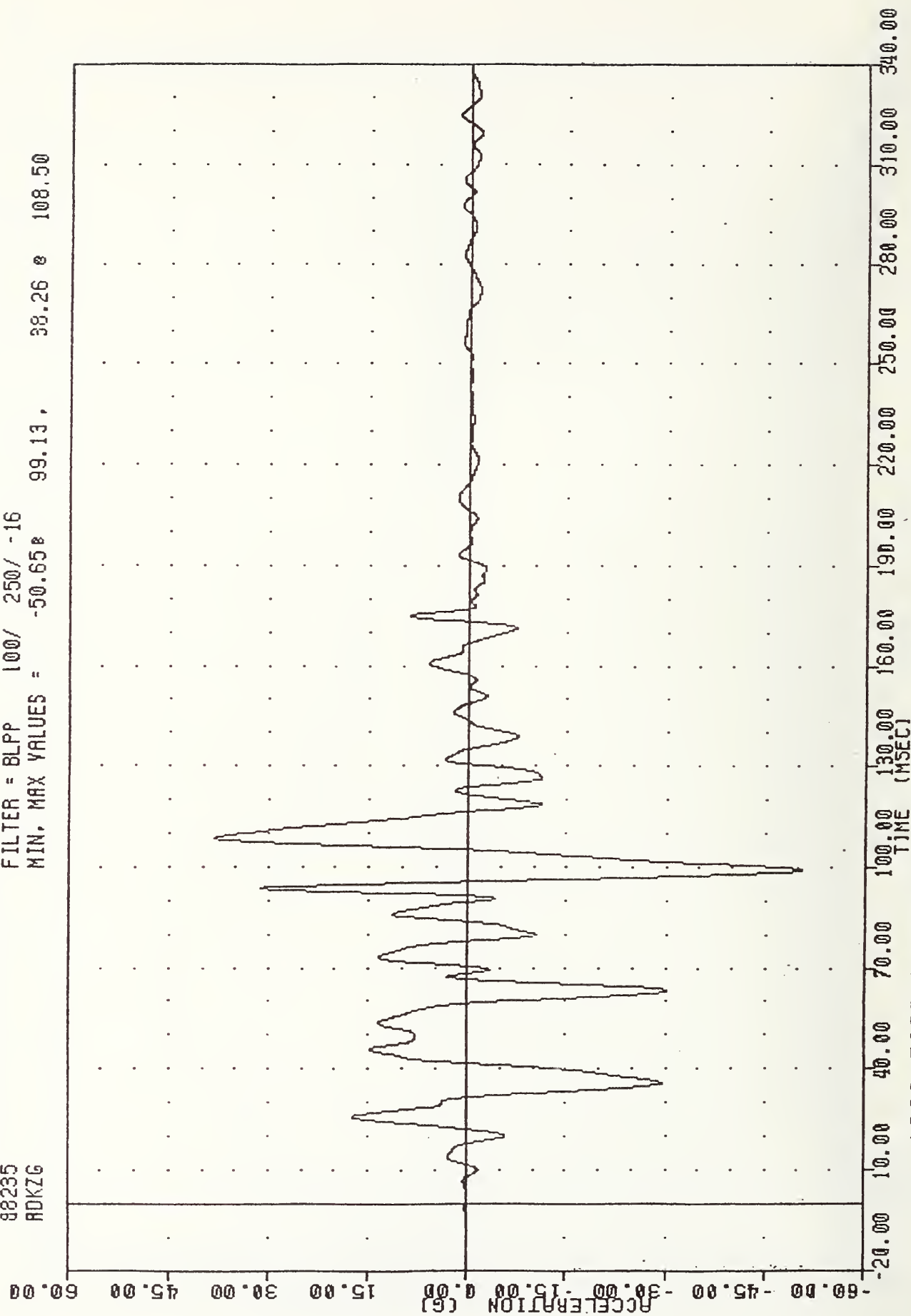
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -4.268 109.38 , 5.76 98.13



VRTC-3 , 880822
DAMAGE ALGORITHM REFORMULATION

88235 FILTER = BLPP 100/ 250/ -16

ADKZG MIN, MAX VALUES = -50.65 99.13 , 38.26 108.50

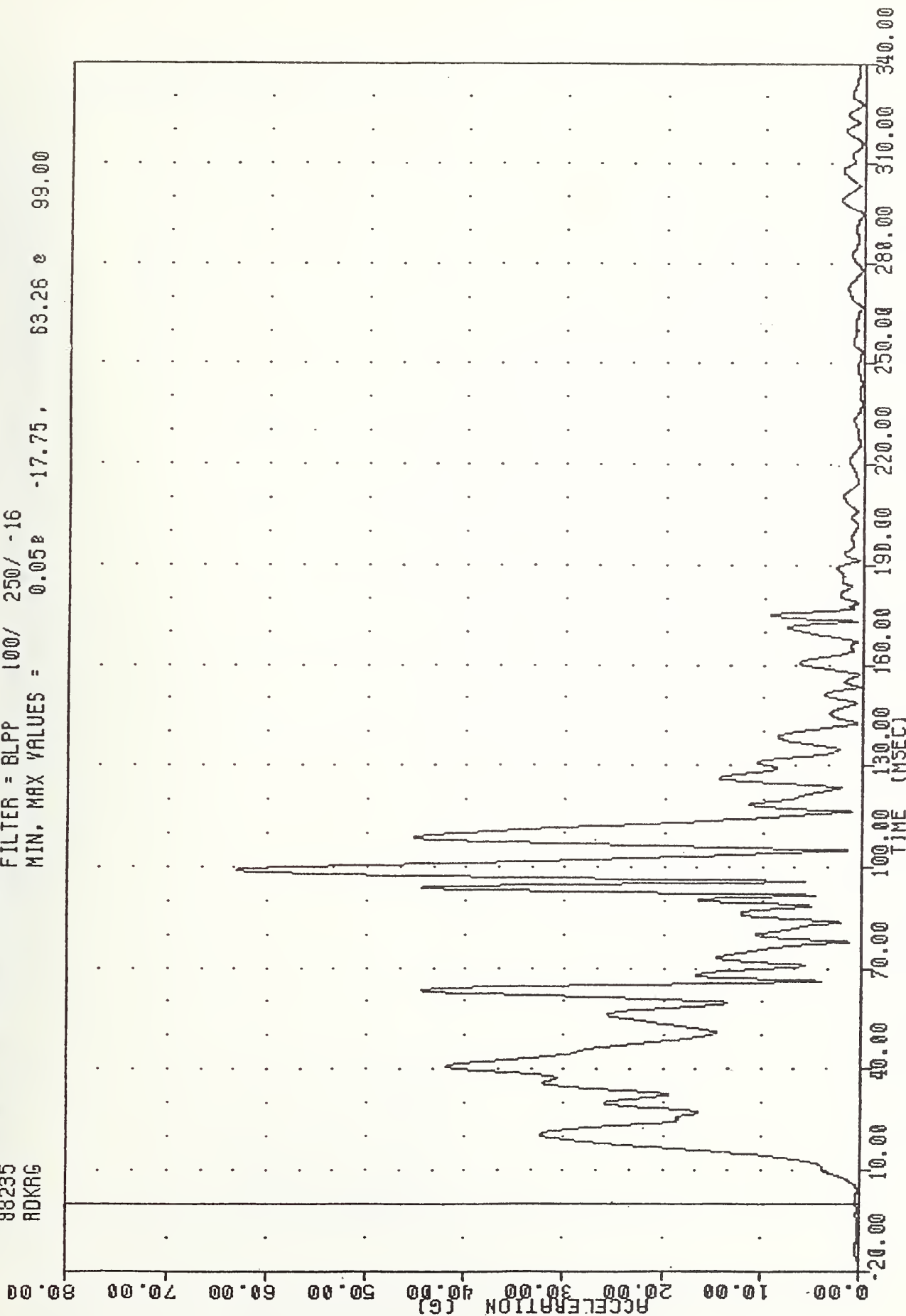


1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH THIRD TEST
VEHICLE REAR DECK Z AXIS ACCELERATION

VRTC-3 , 880822
DAMAGE ALGORITHM REFORMULATION

88235 FILTER = BLPP 100/ 250/ -16

ADKRG MIN, MAX VALUES = 0.052 -17.75, 63.26 e 99.00

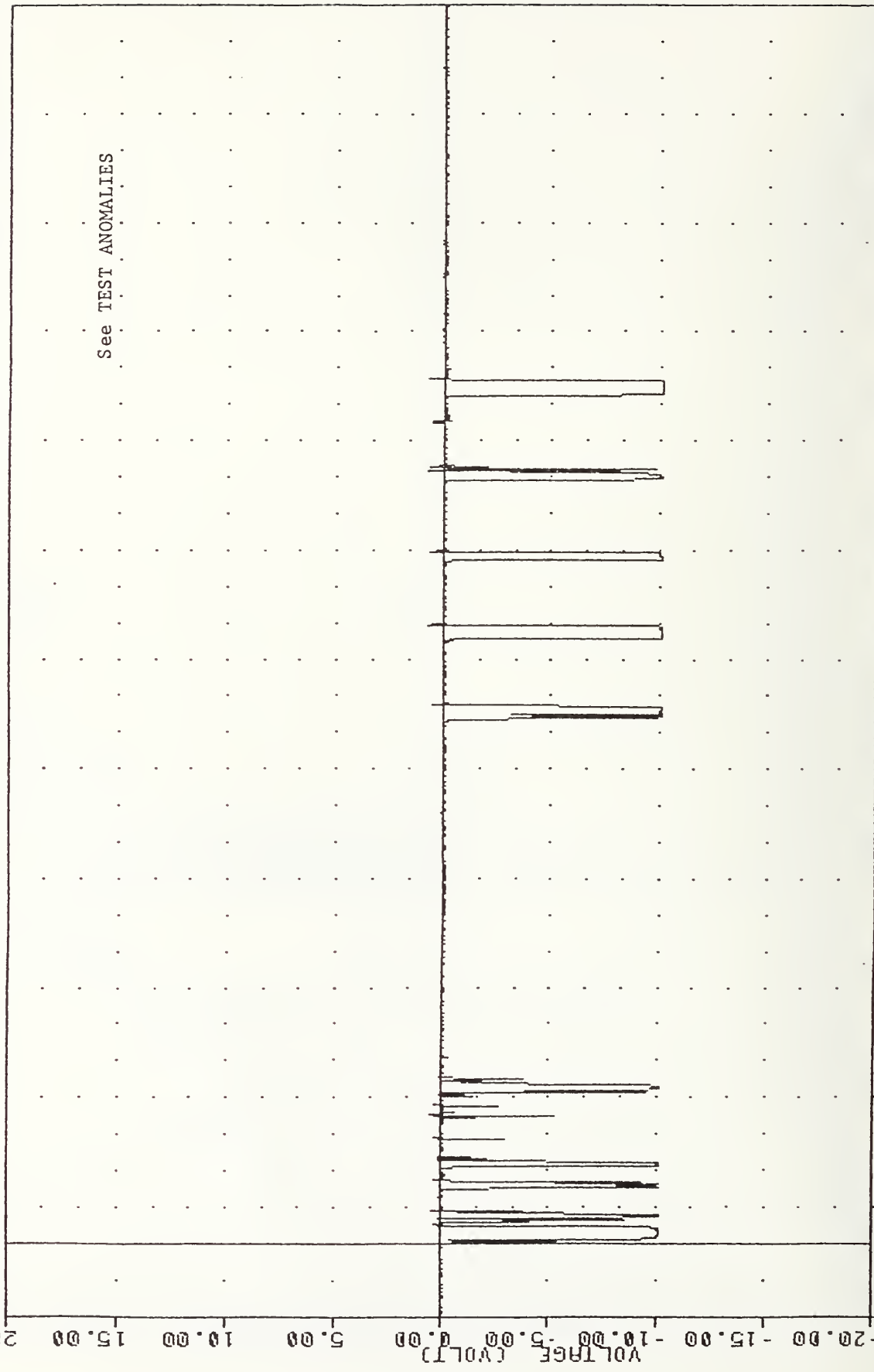


1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH THIRD TEST
VEHICLE REAR DECK RESULTANT ACCELERATION

VRTC-3 , 880822
 DAMAGE ALGORITHM REFORMULATION
 88235
 0TH1

FILTER = ALPF 1650/ 5214/ -40
 MIN. MAX VALUES = -10.18e 2.50 , 0.79 e 169.50

20.00



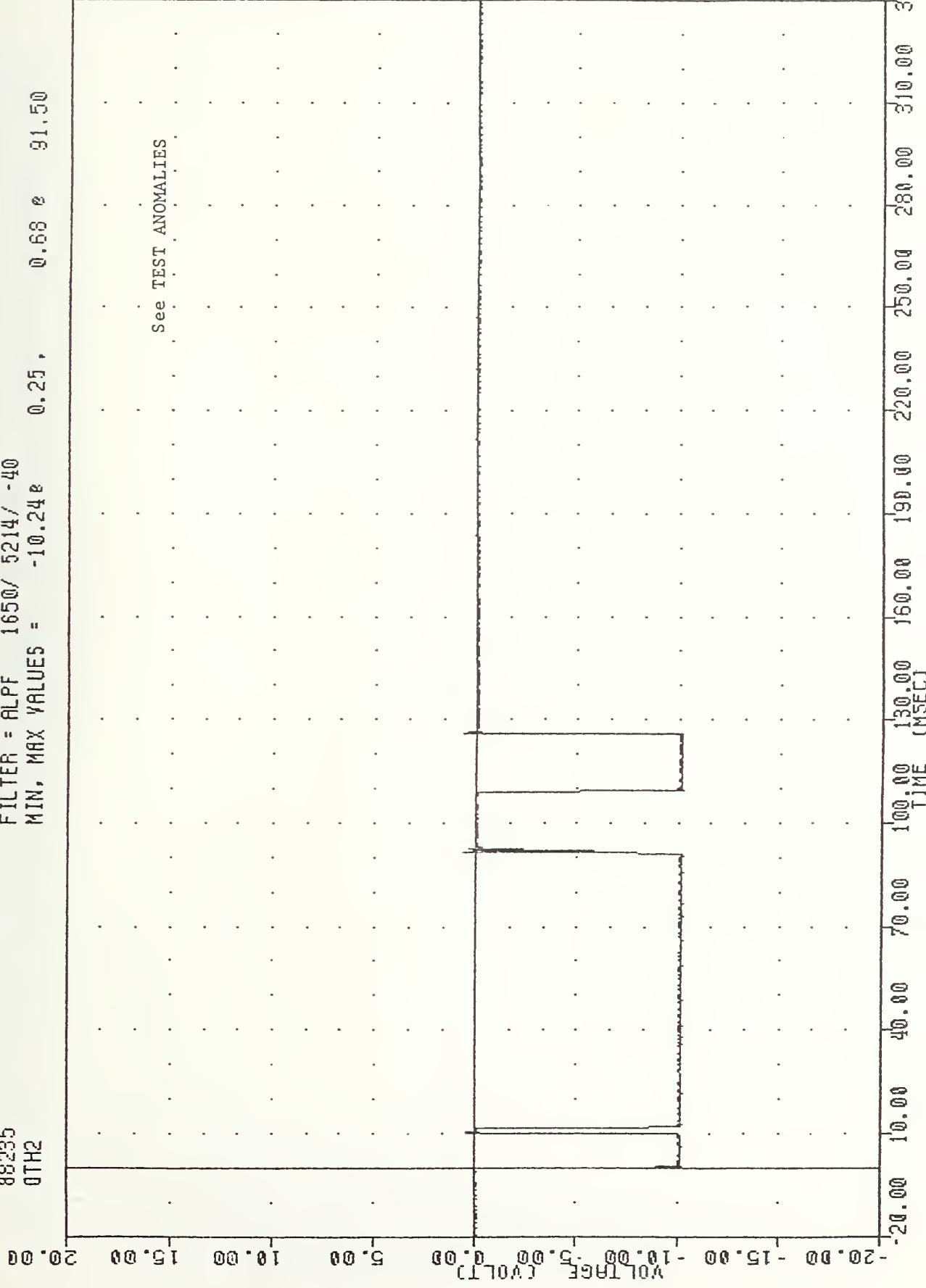
-20.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00

1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH THIRD TEST
 CONTACT SWITCH

VRTC-3 , 880822
DAMAGE ALGORITHM REFORMULATION

88235 FILTER = ALPF 1650/ 5214/ -40

0TH2 MIN, MAX VALUES = -10.24e 0.25, 0.68 e 91.50



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH THIRD TEST
CONTACT SWITCH

VRTC-3 , 830822
 DAMAGE ALGORITHM REFORMULATION

88235 FILTER = ALPF 1650/ 5214/ -40
 0TH3 MIN, MAX VALUES = -10.09e 0.38 , 0.54 e 123.25

20.00

15.00

10.00

5.00

0.00

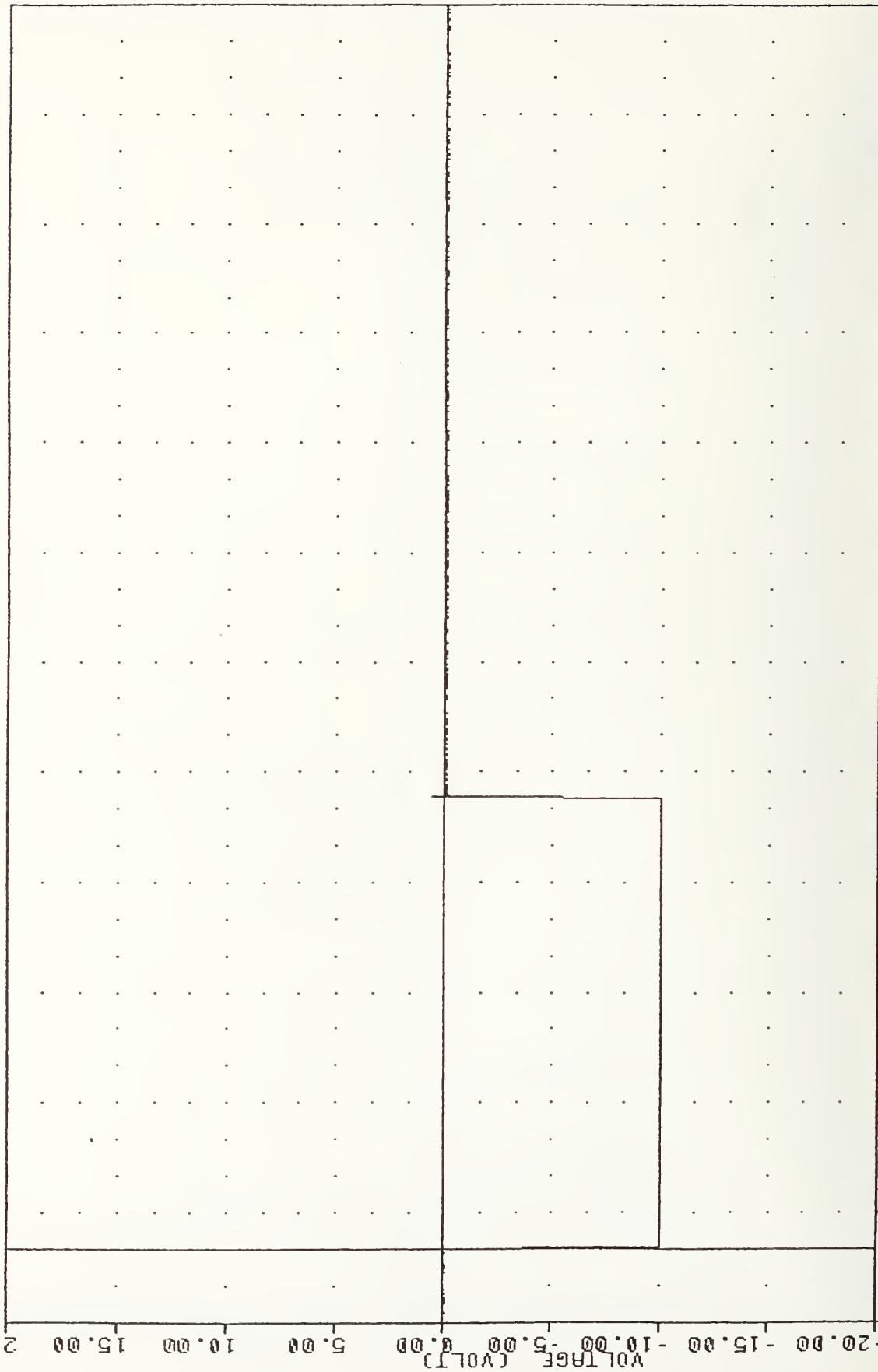
-5.00

-10.00

-15.00

-20.00

-20.00



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH THIRD TEST

CONTACT SWITCH

VRTC-4 . 880823

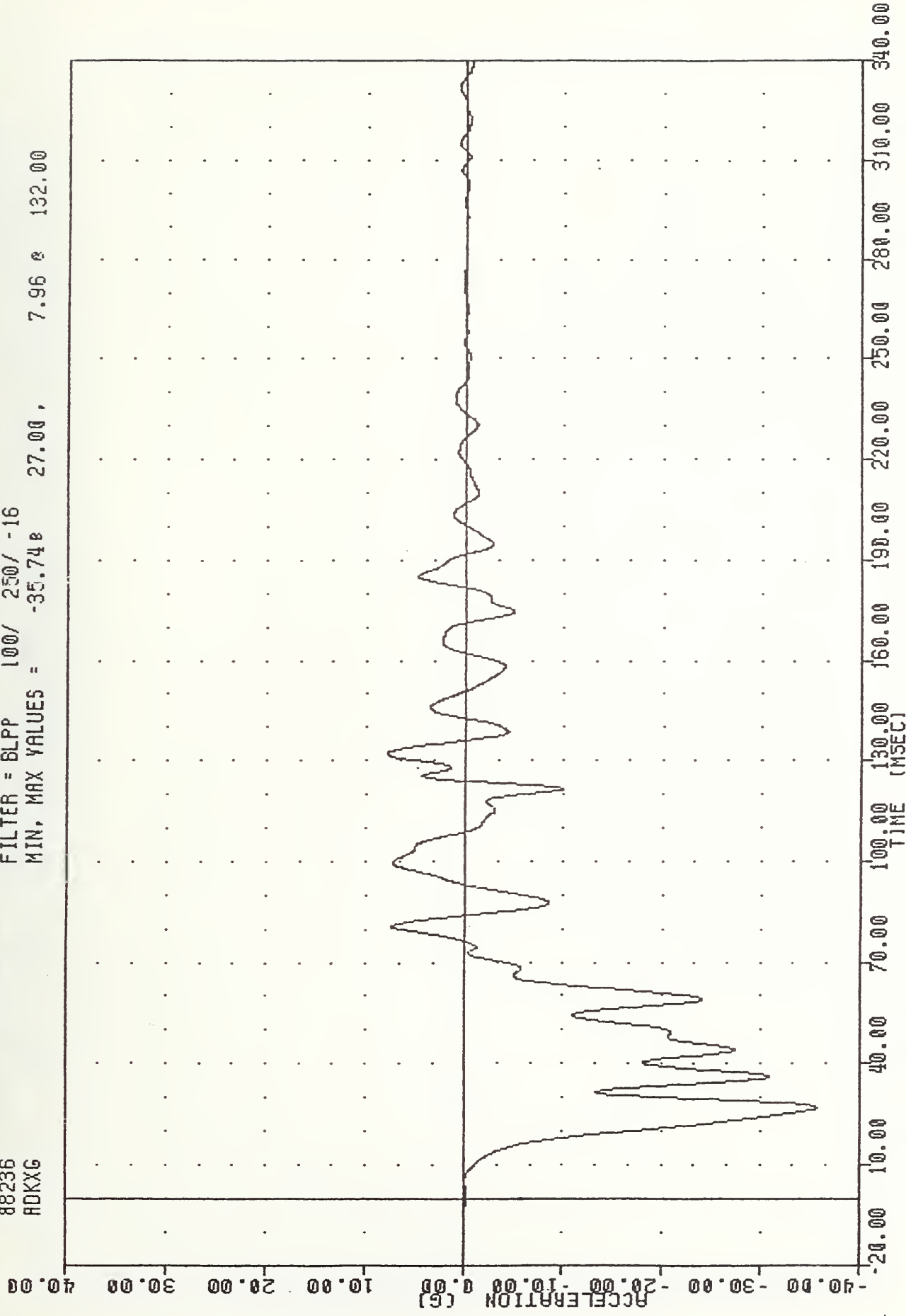
DAMAGE ALGORITHM REFORMULATION

88236

ADKXG

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -35.74e 27.00, 7.96 e 132.00



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH FOURTH TEST
VEHICLE REAR DECK X AXIS ACCELERATION

VRTC-4
DAMAGE ALGORITHM REFORMULATION

880823

88236

ADKXY

FILTER = BLPP 100/ 250/ -16

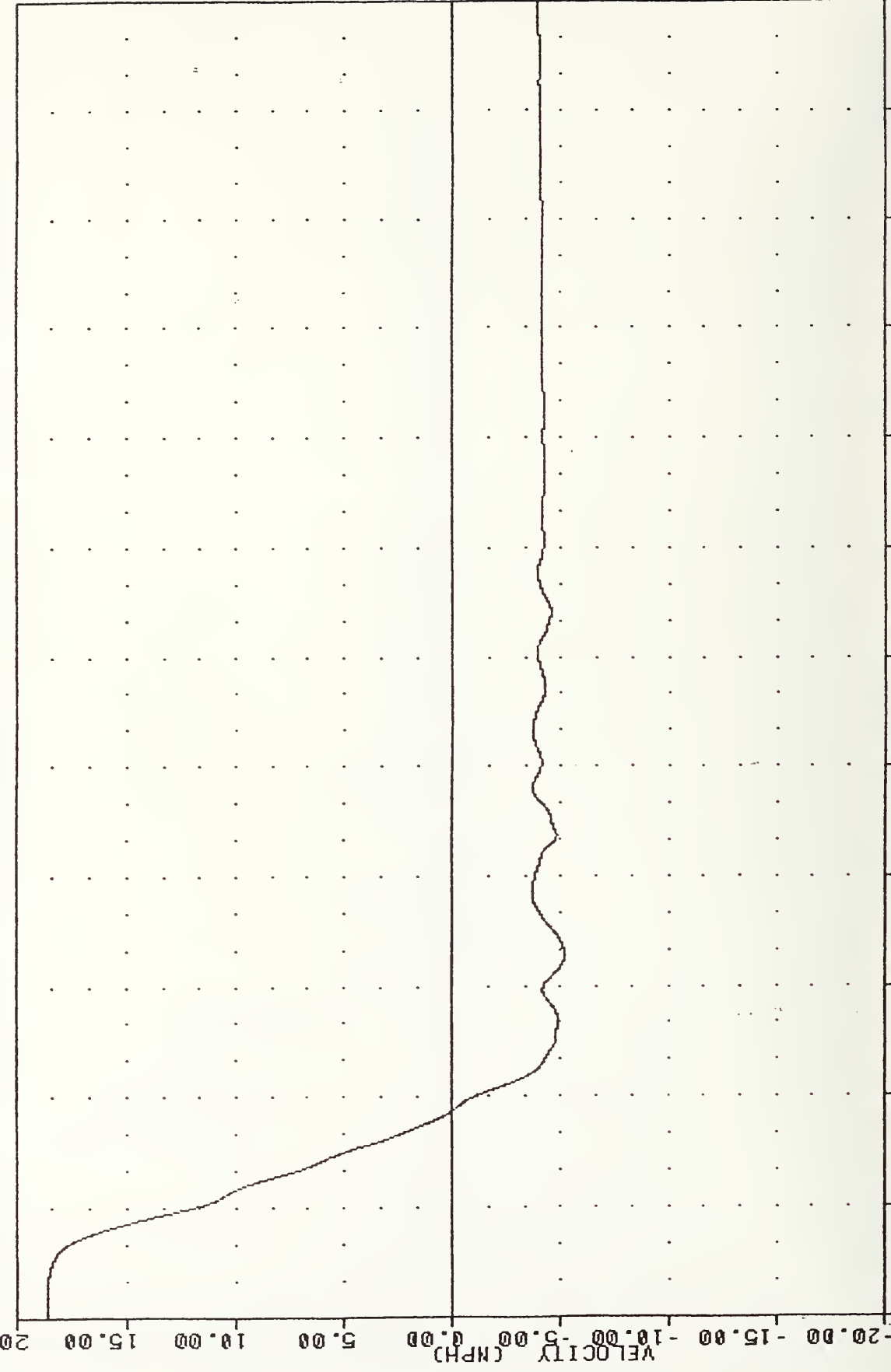
MIN. MAX VALUES =

-5.17 92.88

18.60

0.00

20.00



0.00

28.33

56.66

85.00

113.33

141.66

170.00

198.33

226.66

255.00

283.33

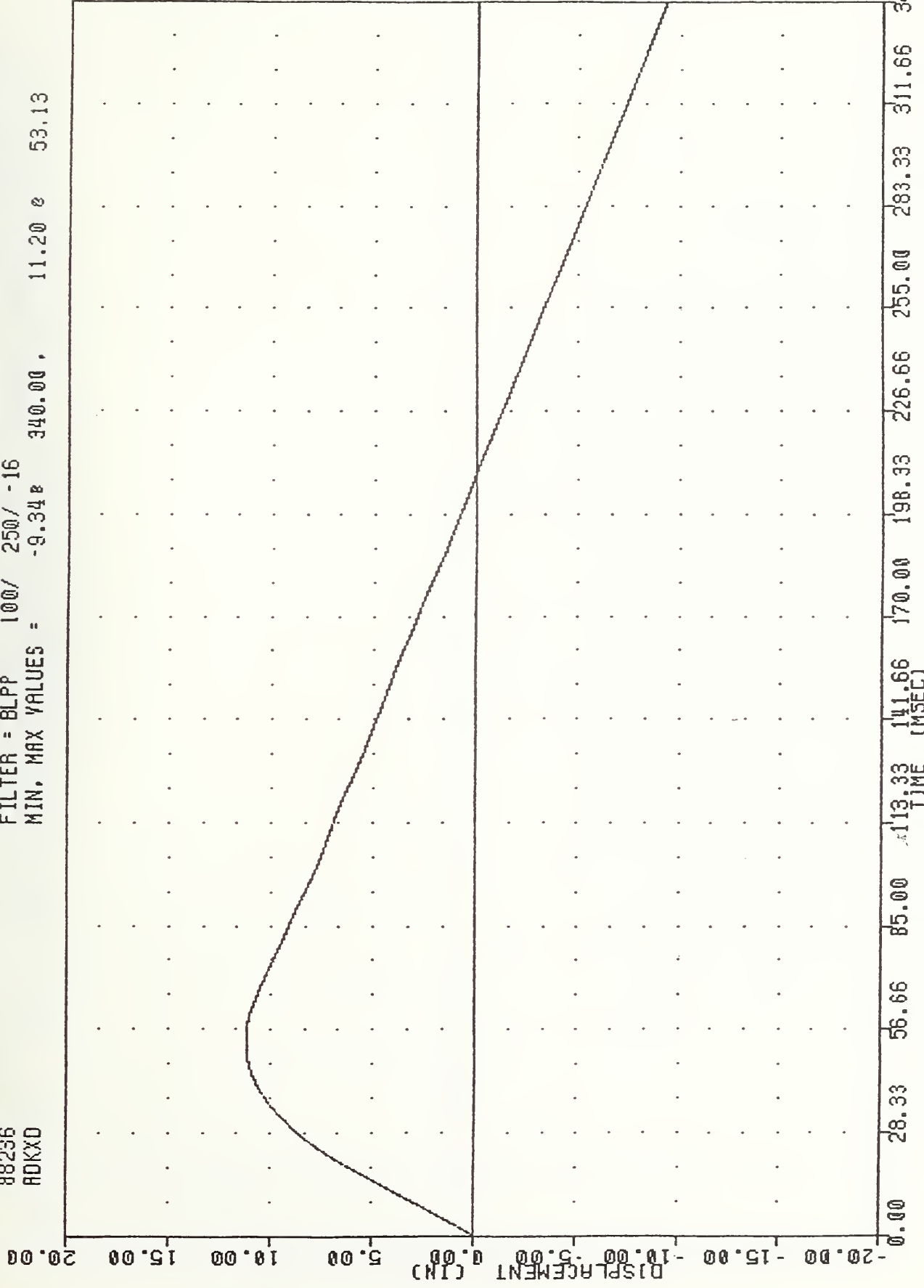
311.66

340.00

1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH FOURTH TEST
VEHICLE REAR DECK X AXIS VELOCITY

VRTC-4 , 880823
DAMAGE ALGORITHM REFORMULATION

88236
ADKXD
FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -9.34 340.00 , 11.20 53.13



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH FOURTH TEST
VEHICLE REAR DECK X AXIS DISPLACEMENT

YRTC-4 , 880823

DAMAGE ALGORITHM REFORMULATION

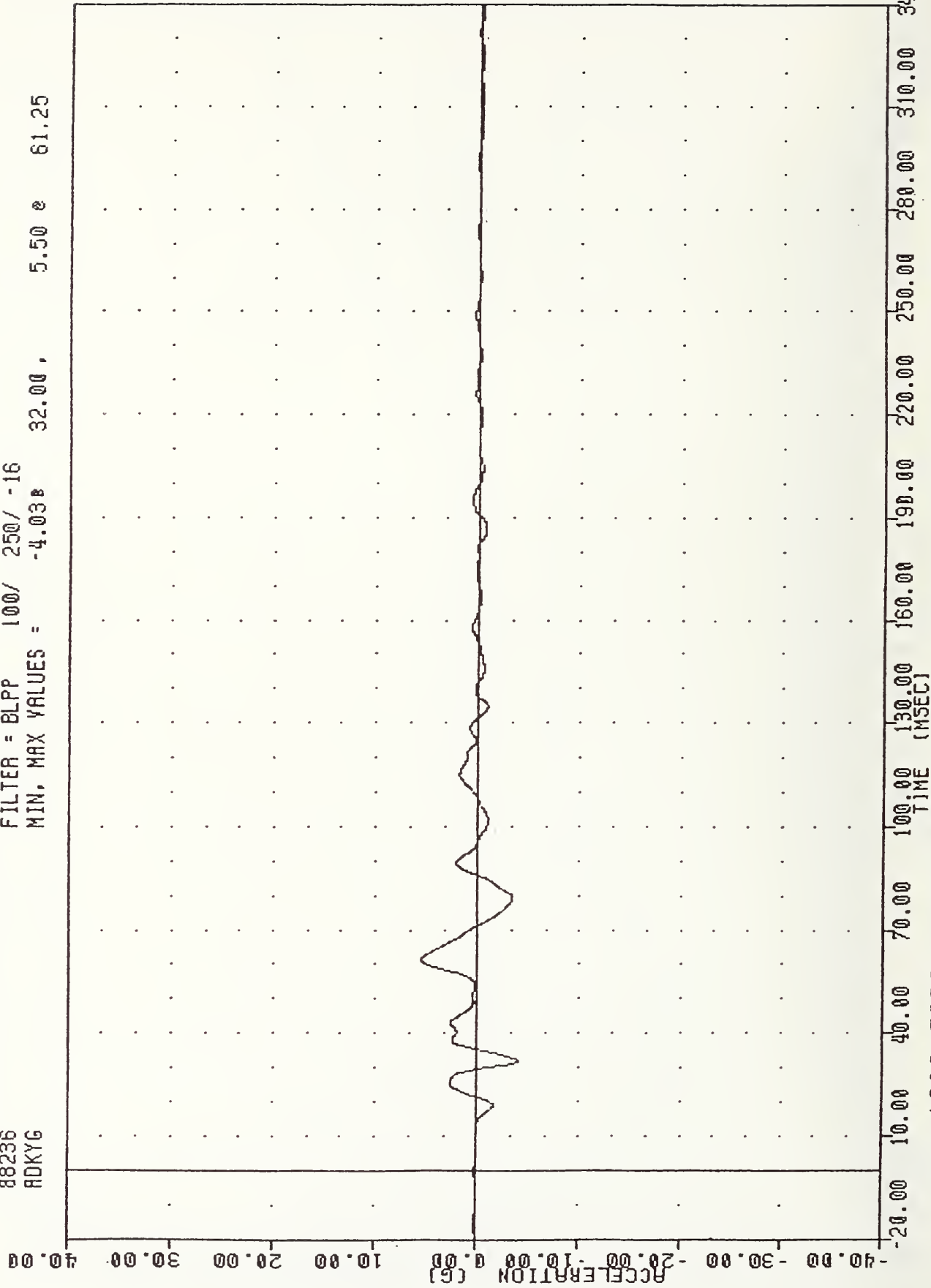
88236

ADKYG

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -4.03 32.00 ,

5.50 e 61.25



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH FOURTH TEST
VEHICLE REAR DECK Y AXIS ACCELERATION

VRTC-4 , 880823

DAMAGE ALGORITHM REFORMULATION

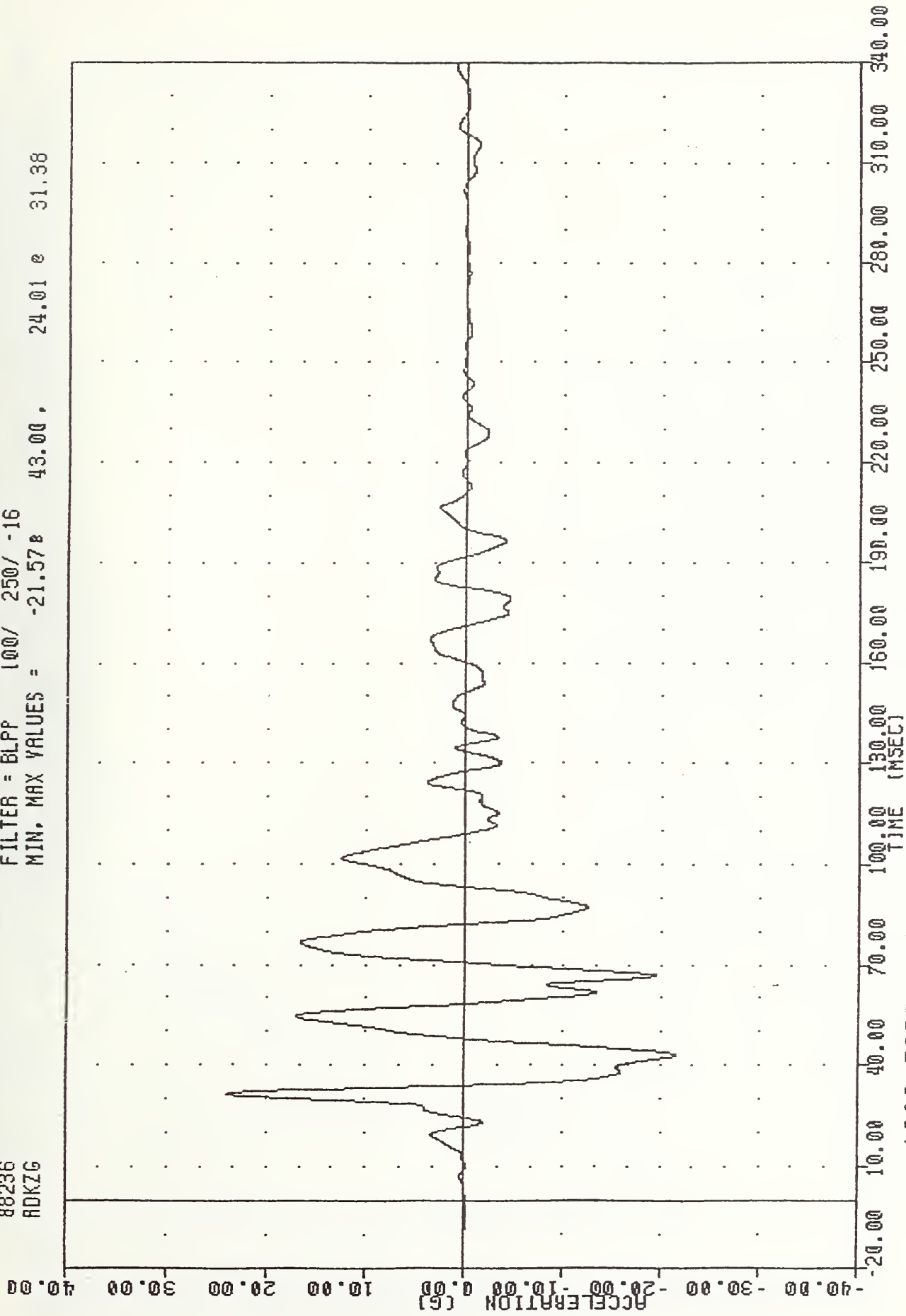
88236

ADKZG

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -21.57 43.00 ,

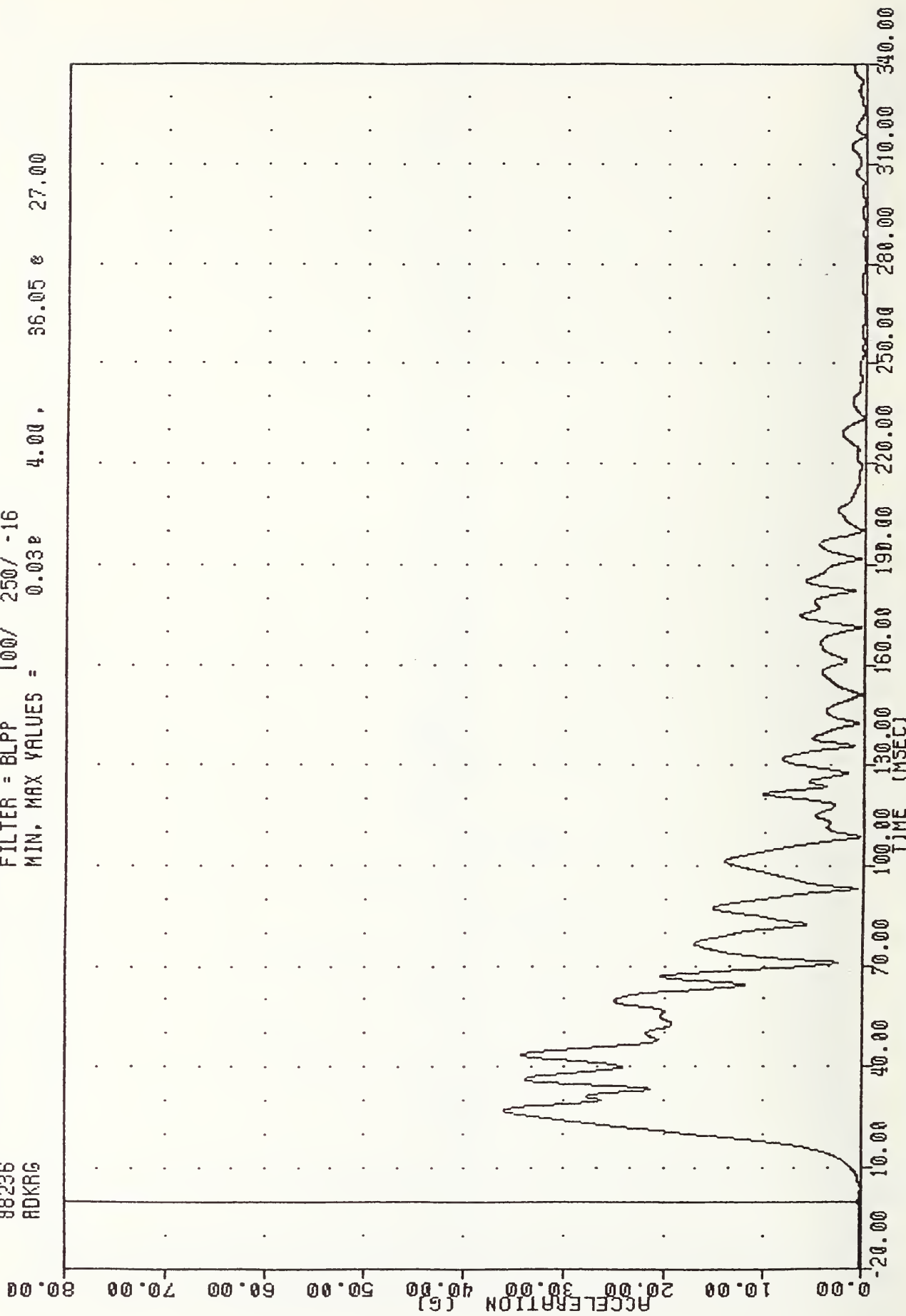
24.01 e 31.38



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH FOURTH TEST
VEHICLE REAR DECK Z AXIS ACCELERATION

VRTC-4 , 880823
DAMAGE ALGORITHM REFORMULATION
88236
ADKRG

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = 0.03e 4.00 , 36.05 e 27.00



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH FOURTH TEST
VEHICLE REAR DECK RESULTANT ACCELERATION

VRTC-4 , 880823

DAMAGE ALGORITHM REFORMULATION

88236

QTH1

FILTER = ALPF 1650/ 5214/ -40

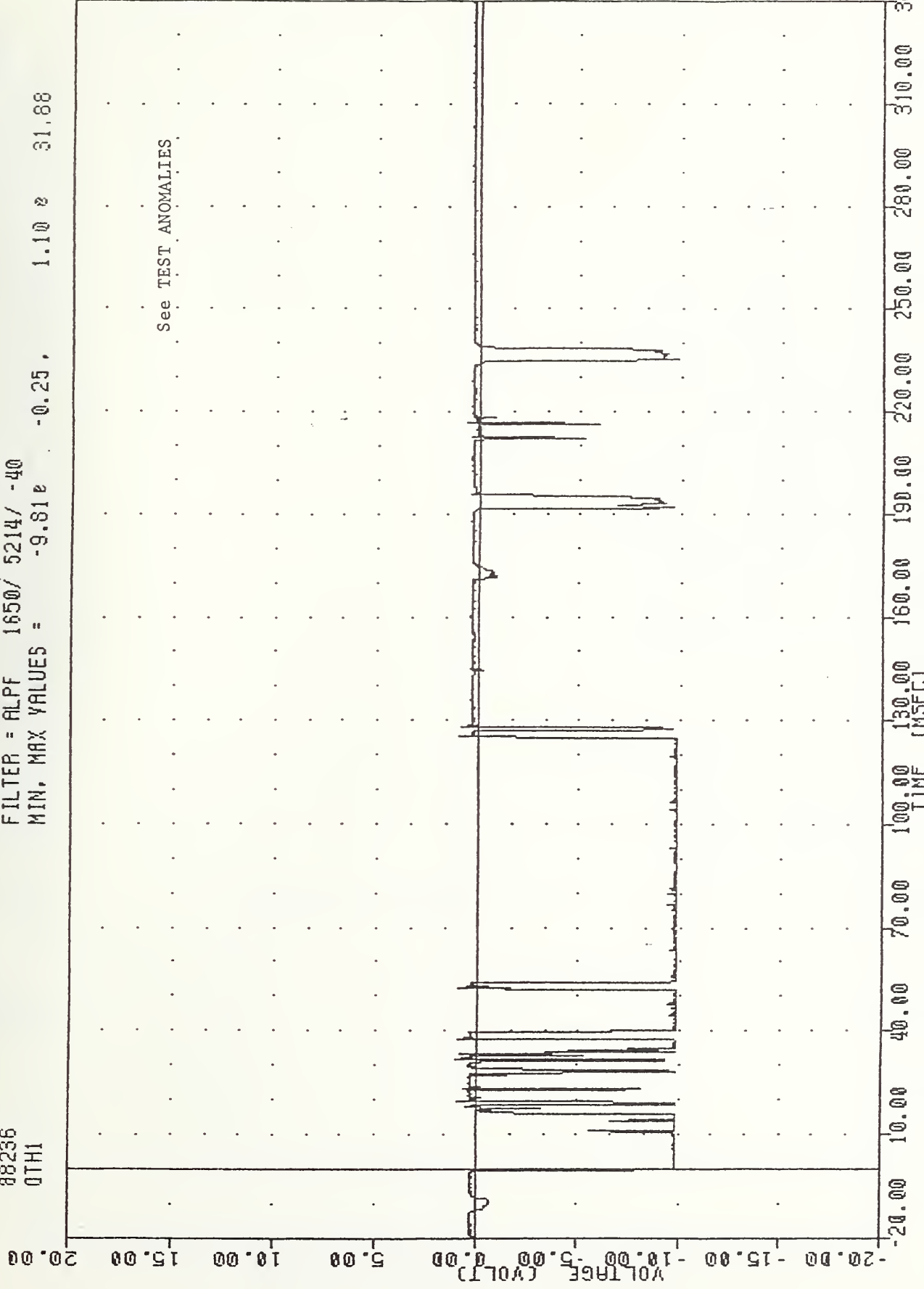
MIN, MAX VALUES =

-9.81e

-0.25 ,

1.10 e

31.88

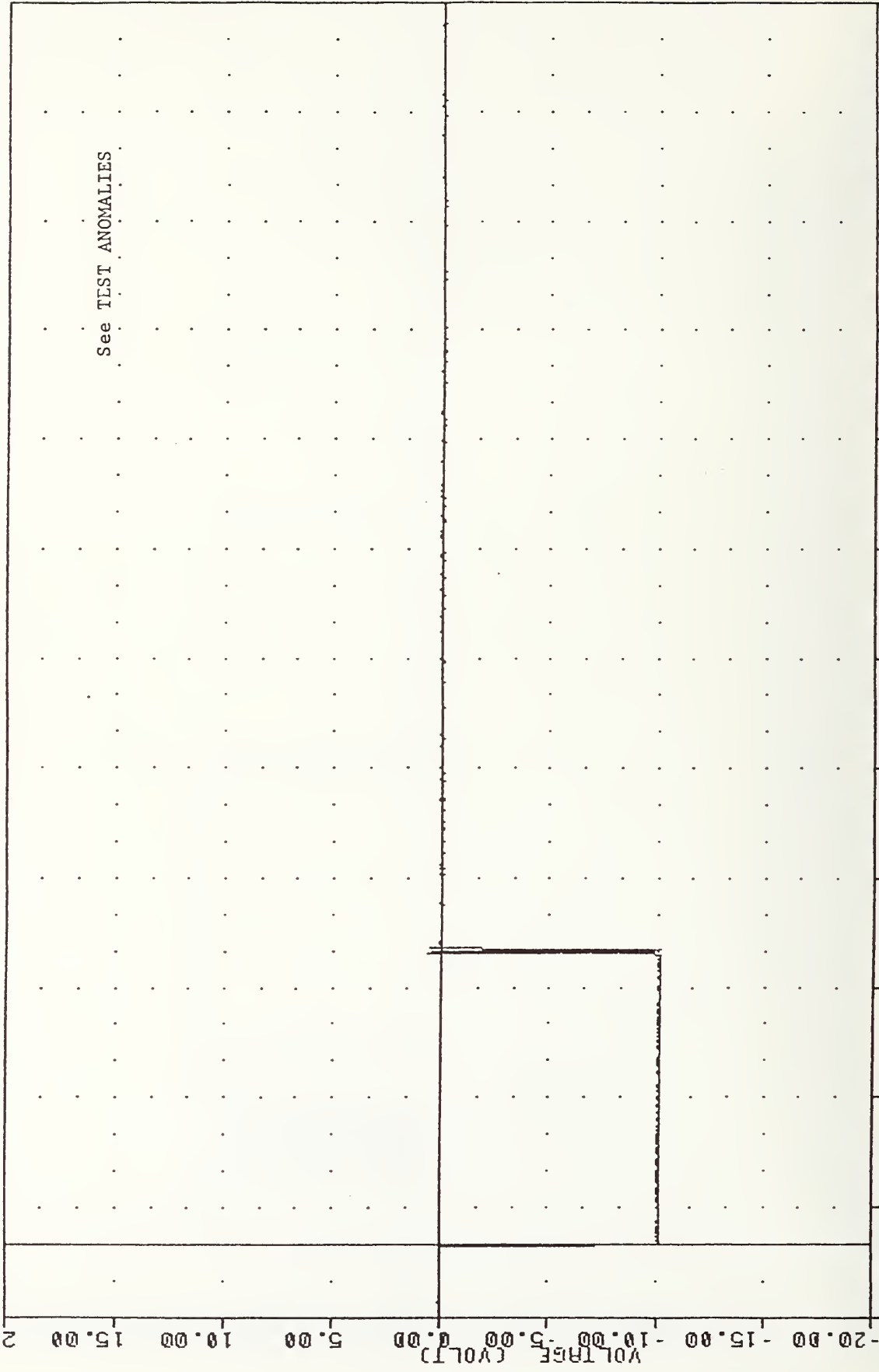


1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH FOURTH TEST

CONTACT SWITCH

YRTC-4 , 880823
 DAMAGE ALGORITHM REFORMULATION
 88236
 0TH2

FILTER = ALPF 1650/ 5214/ -40
 MIN, MAX VALUES = -10.14e 0.00 , 0.64 e 79.50



-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
 TIME (NSEC)
 1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH FOURTH TEST
 CONTACT SWITCH

WRTC-4 , 880823

DAMAGE ALGORITHM REFORMULATION

88236

0THS

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -10.078

0.63 , 0.61 8 125.38

20.00

15.00

10.00

5.00

0.00

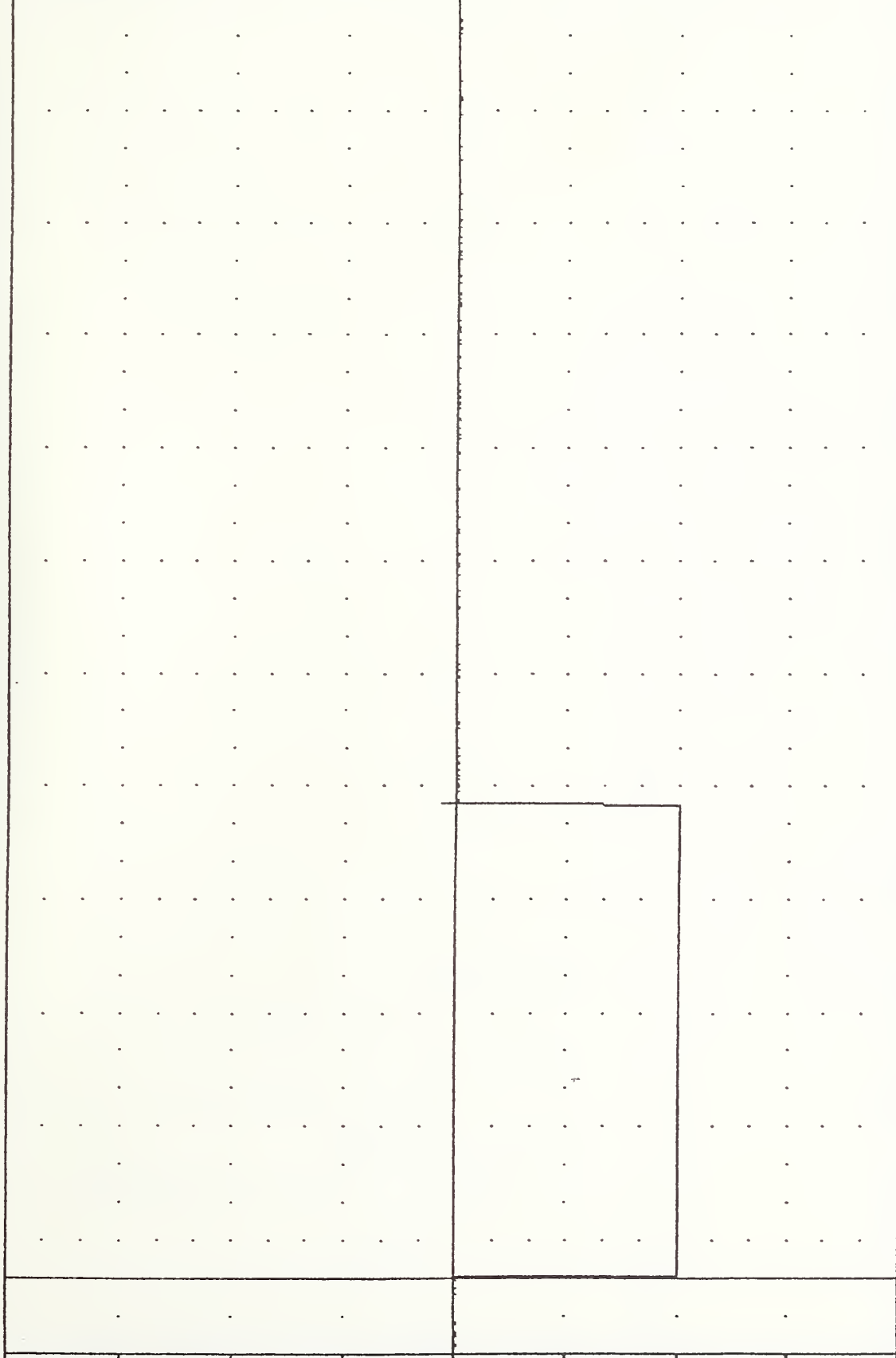
-5.00

-10.00

-15.00

-20.00

VOLTAGE (VOLT)



10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00

1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 20 MPH FOURTH TEST
CONTACT SWITCH

VRTC-5, 880823

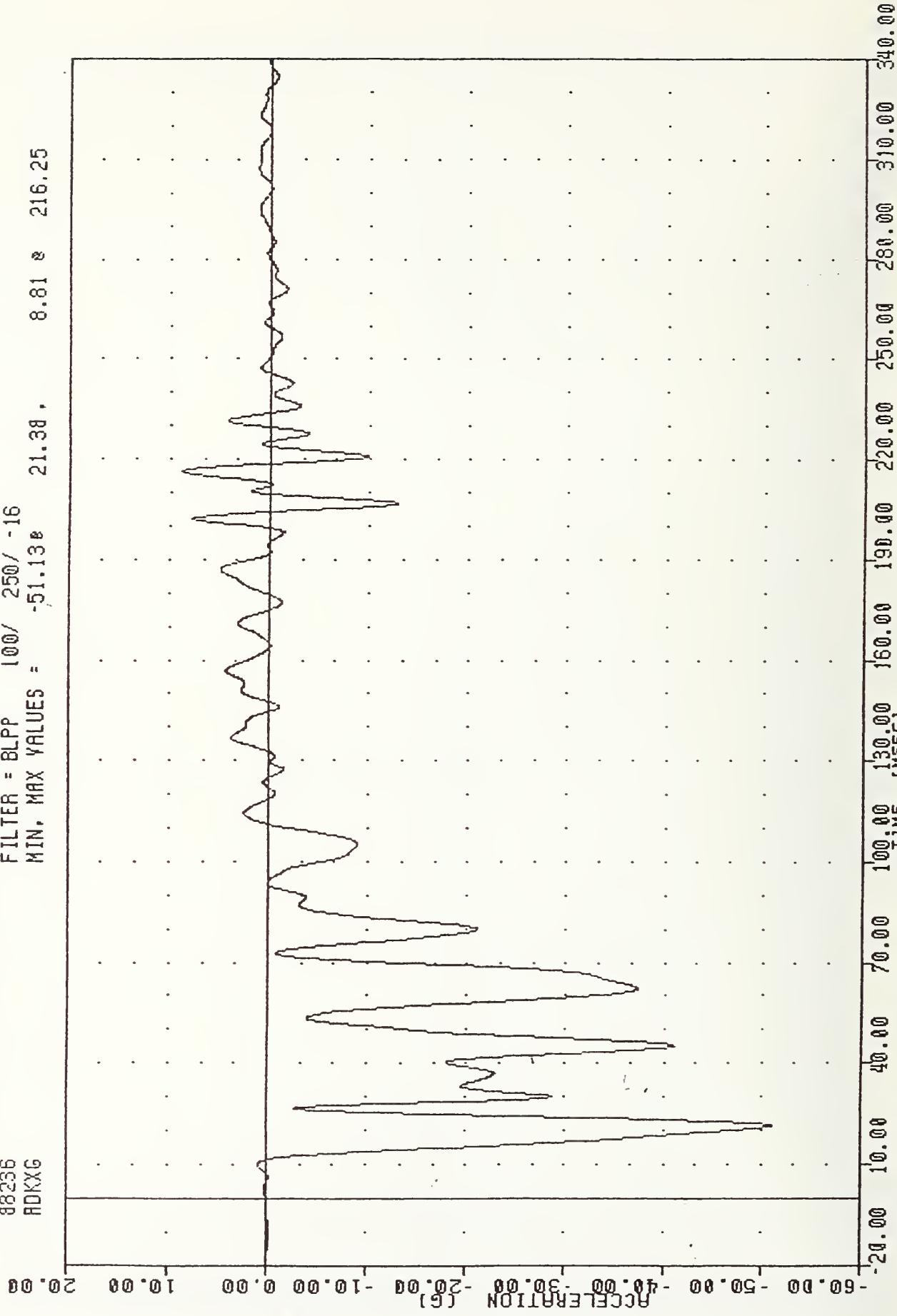
DAMAGE ALGORITHM REFORMULATION

88236

ADKXG

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -51.13 21.38, 8.81 216.25



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 30 MPH FIFTH TEST
VEHICLE REAR DECK X AXIS ACCELERATION

VRTC-5 , 880823

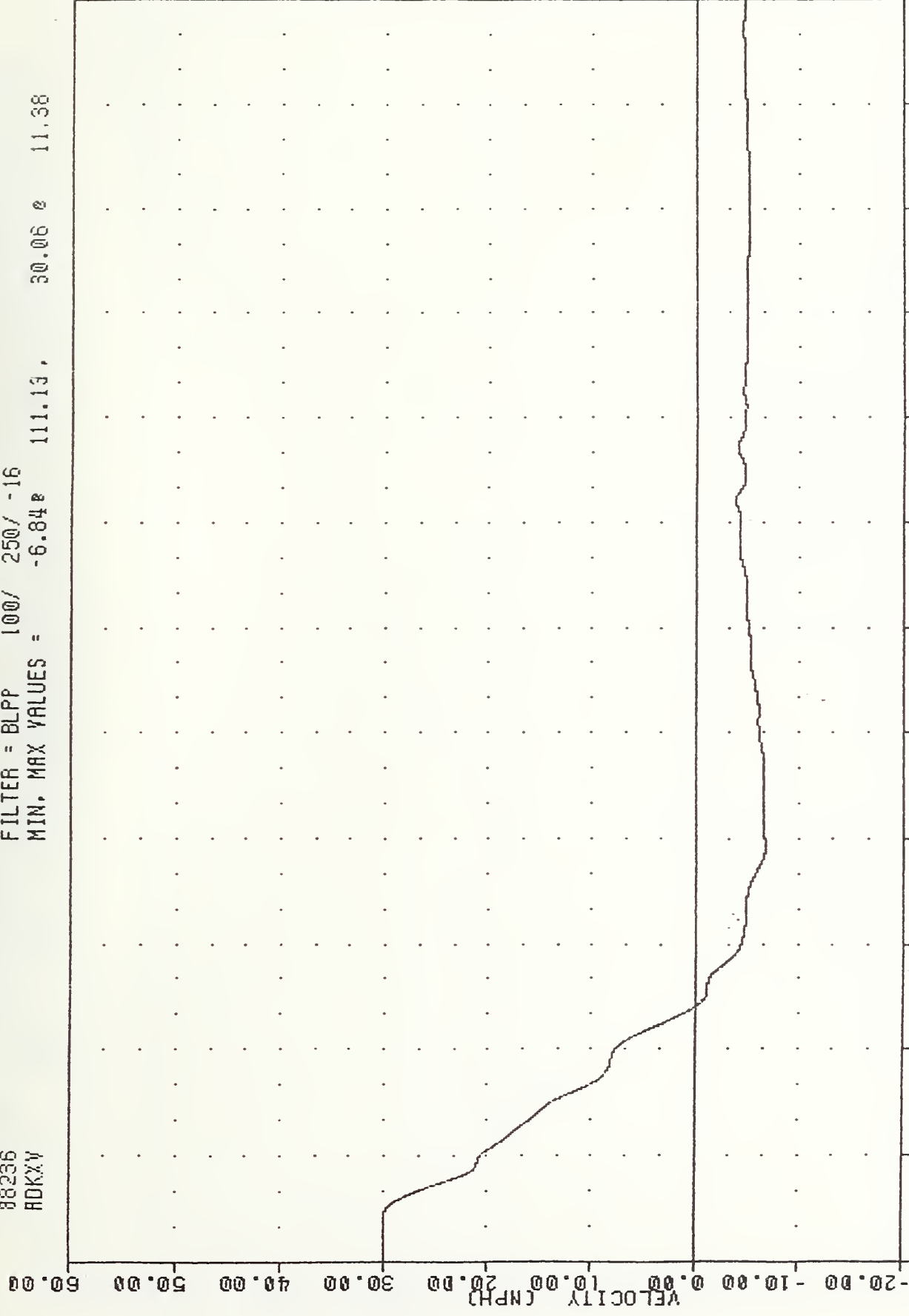
DAMAGE ALGORITHM REFORMULATION

88236

ADKXV

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -6.84e 111.13, 30.06 e 11.38



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 30 MPH FIFTH TEST
VEHICLE REAR DECK X AXIS VELOCITY

VRTC-5 , 880823

DAMAGE ALGORITHM REFORMULATION

88236

FILTER = BLPP 100/ 250/ -16

ADKXD

MIN, MAX VALUES = -2.88 340.00 ,

21.12 67.88

35.00

30.00

25.00

20.00

15.00

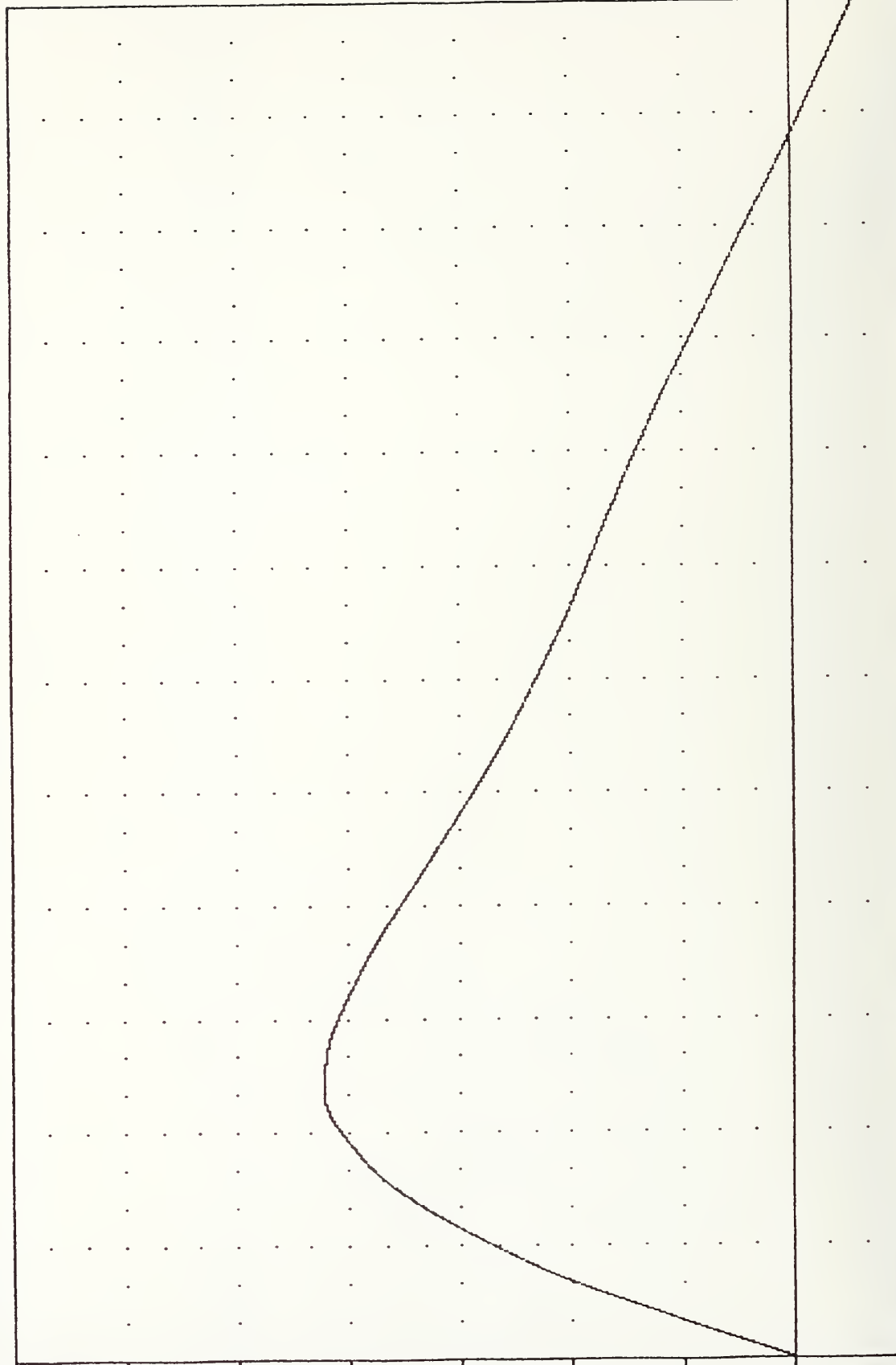
10.00

5.00

0.00

-5.00

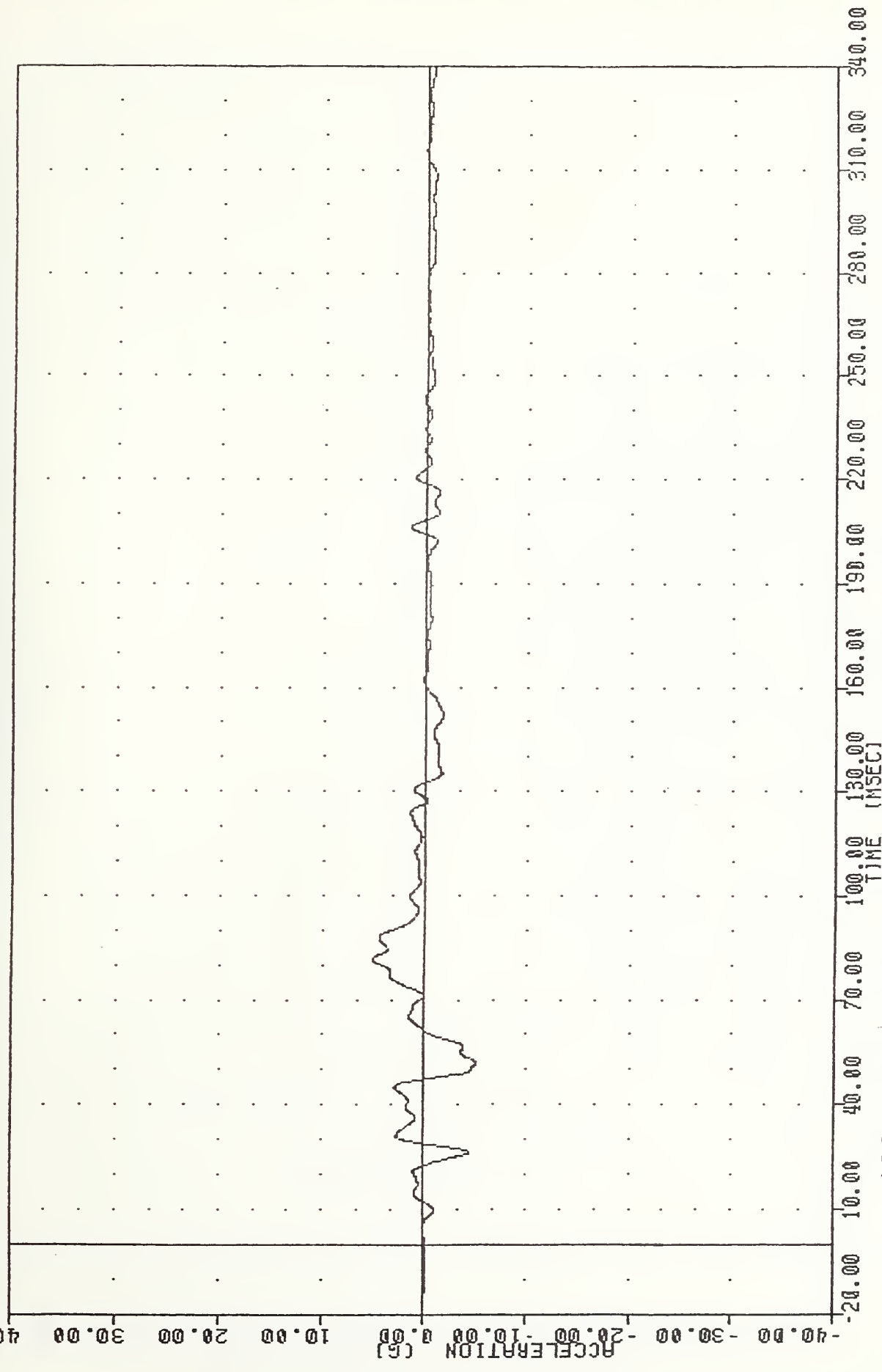
DISPLACEMENT (IN)



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 30 MPH FIFTH TEST
VEHICLE REAR DECK X AXIS DISPLACEMENT

VRTC-5 , 880823
 DAMAGE ALGORITHM REFORMULATION
 88236
 ADKY6

FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -5.00e 51.88 , 5.24 e 81.50

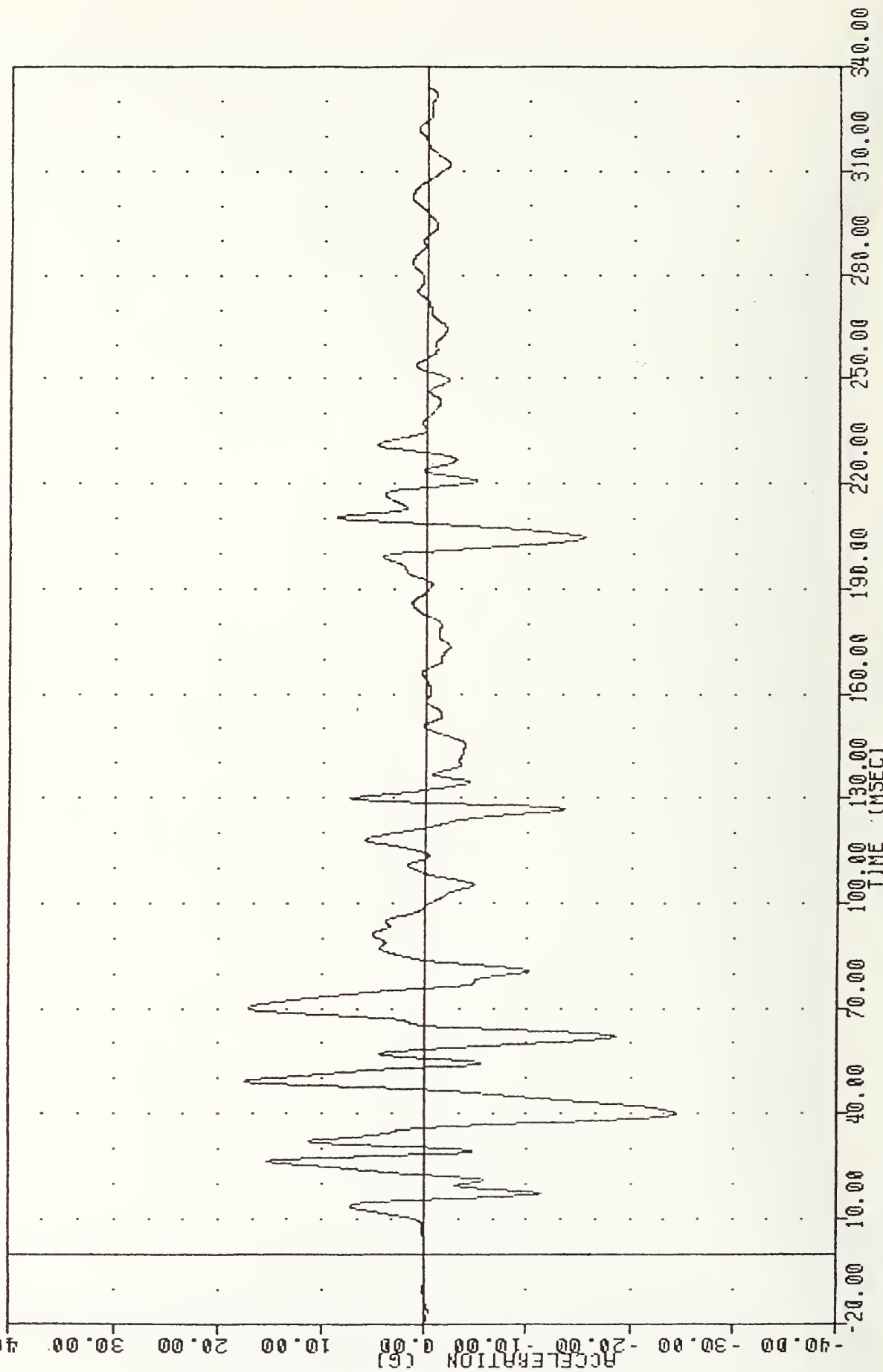


1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 30 MPH FIFTH TEST
 VEHICLE REAR DECK Y AXIS ACCELERATION

VRTC-5 , 880823
DAMAGE ALGORITHM REFORMULATION

88236 FILTER = BLPP 100/ 250/ -16

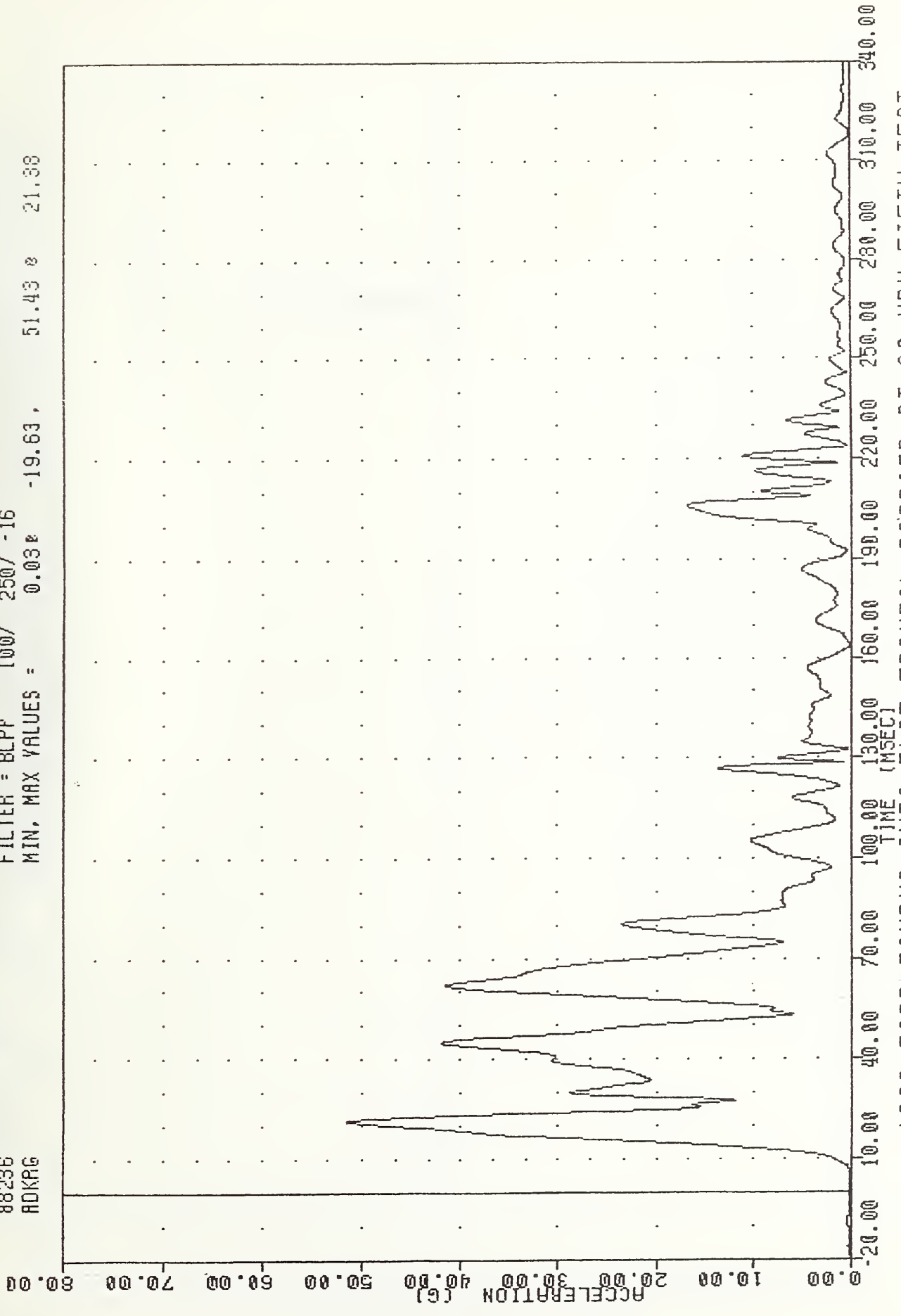
ADKZG MIN, MAX VALUES = -24.62g 40.00 , 17.46 g 49.25



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 30 MPH FIFTH TEST
VEHICLE REAR DECK Z AXIS ACCELERATION

VRTC-5 , 880823
DAMAGE ALGORITHM REFORMULATION
88236
ADKRG

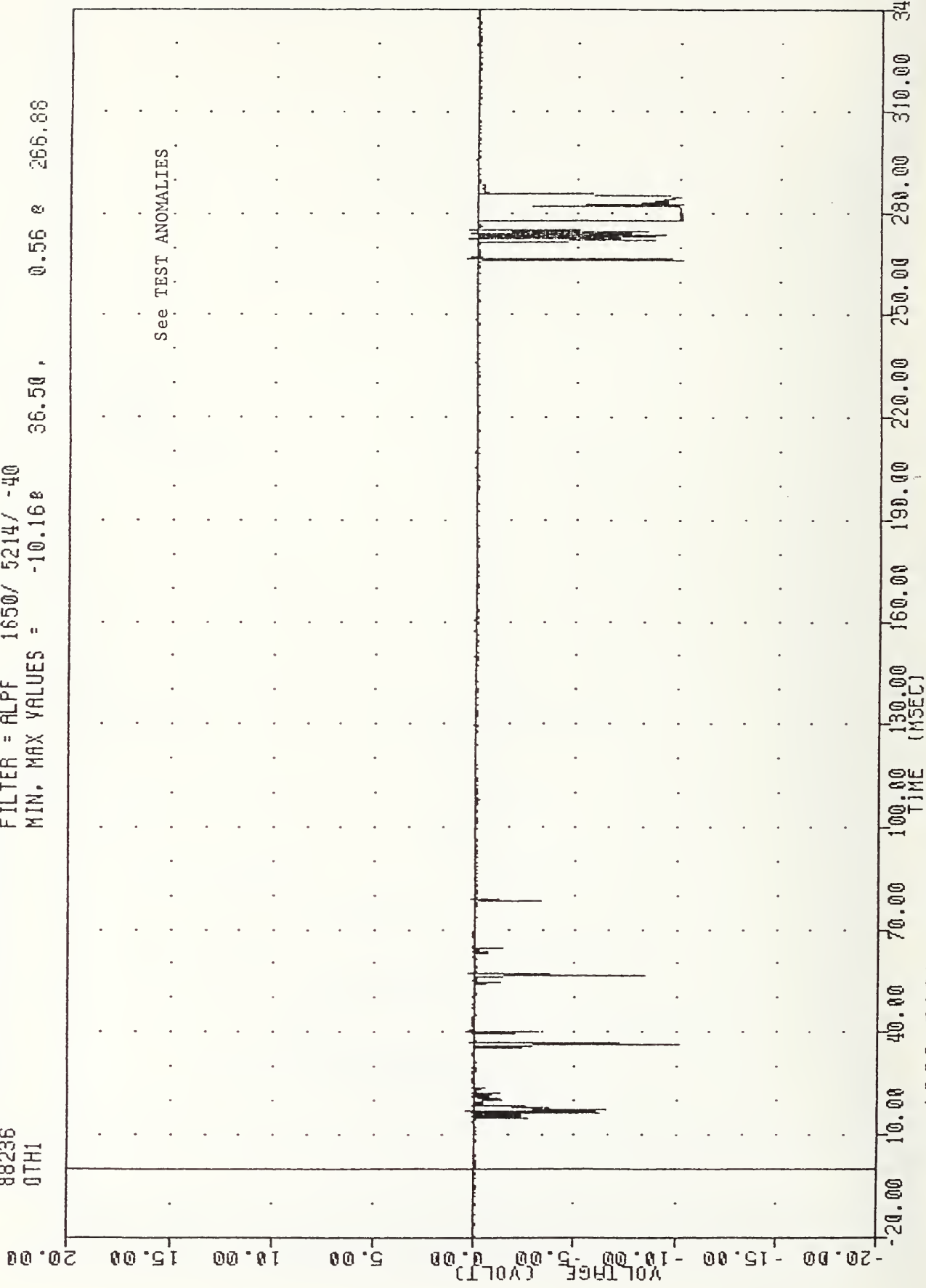
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = 0.032 -19.63, 51.43 21.33



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 30 MPH FIFTH TEST
VEHICLE REAR DECK RESULTANT ACCELERATION

VRTC-5 , 880823
DAMAGE ALGORITHM REFORMULATION

88236
0TH1
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -10.168 36.50 , 0.56 266.88



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 30 MPH FIFTH TEST
CONTACT SWITCH

VRTC-5 , 880823

DAMAGE ALGORITHM REFORMULATION

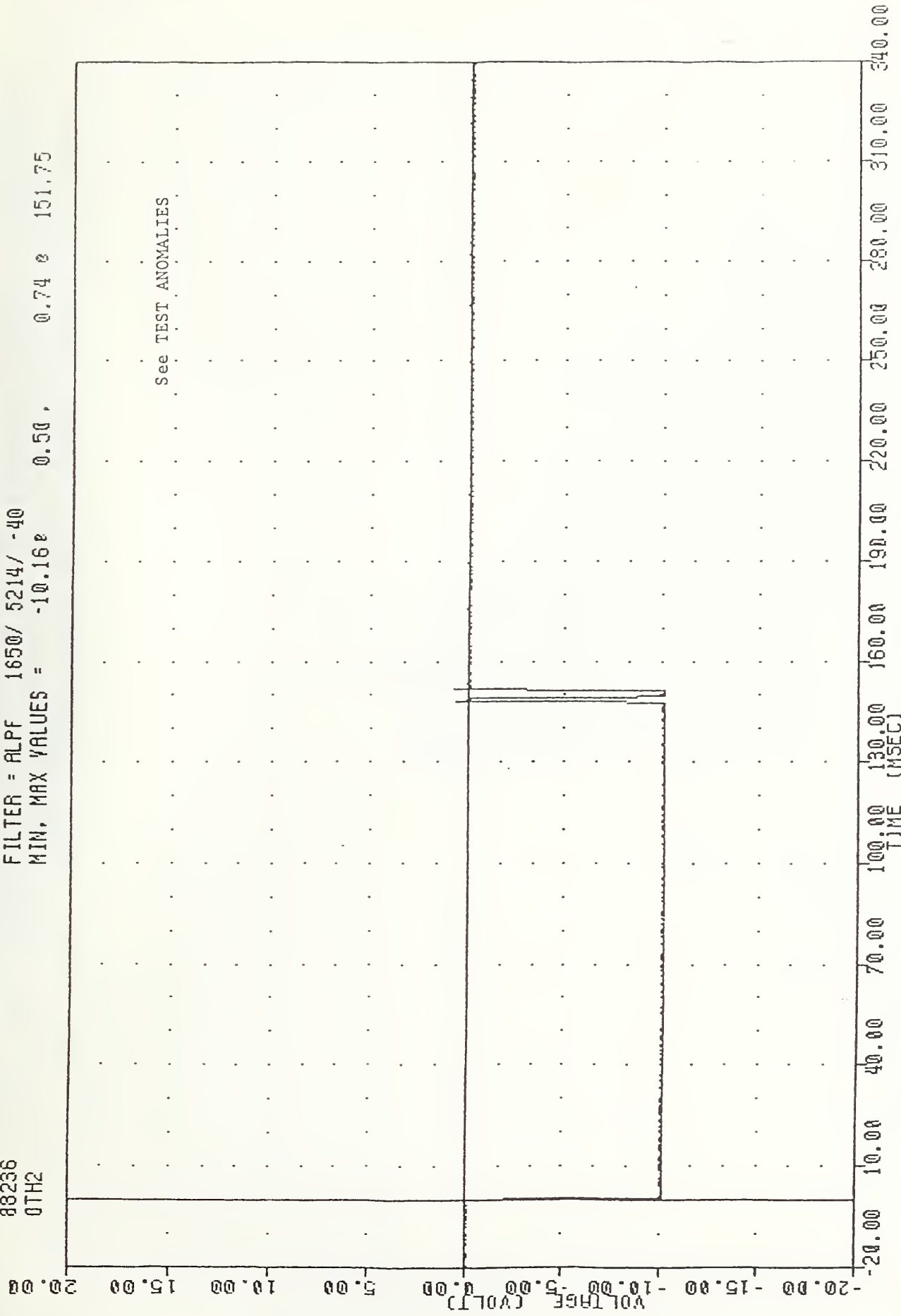
88236

0TH2

FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = -10.162

0.50 , 0.74 & 151.75



1988 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 30 MPH FIFTH TEST
CONTACT SWITCH

VRTC-5 , 880823
 DAMAGE ALGORITHM REFORMULATION

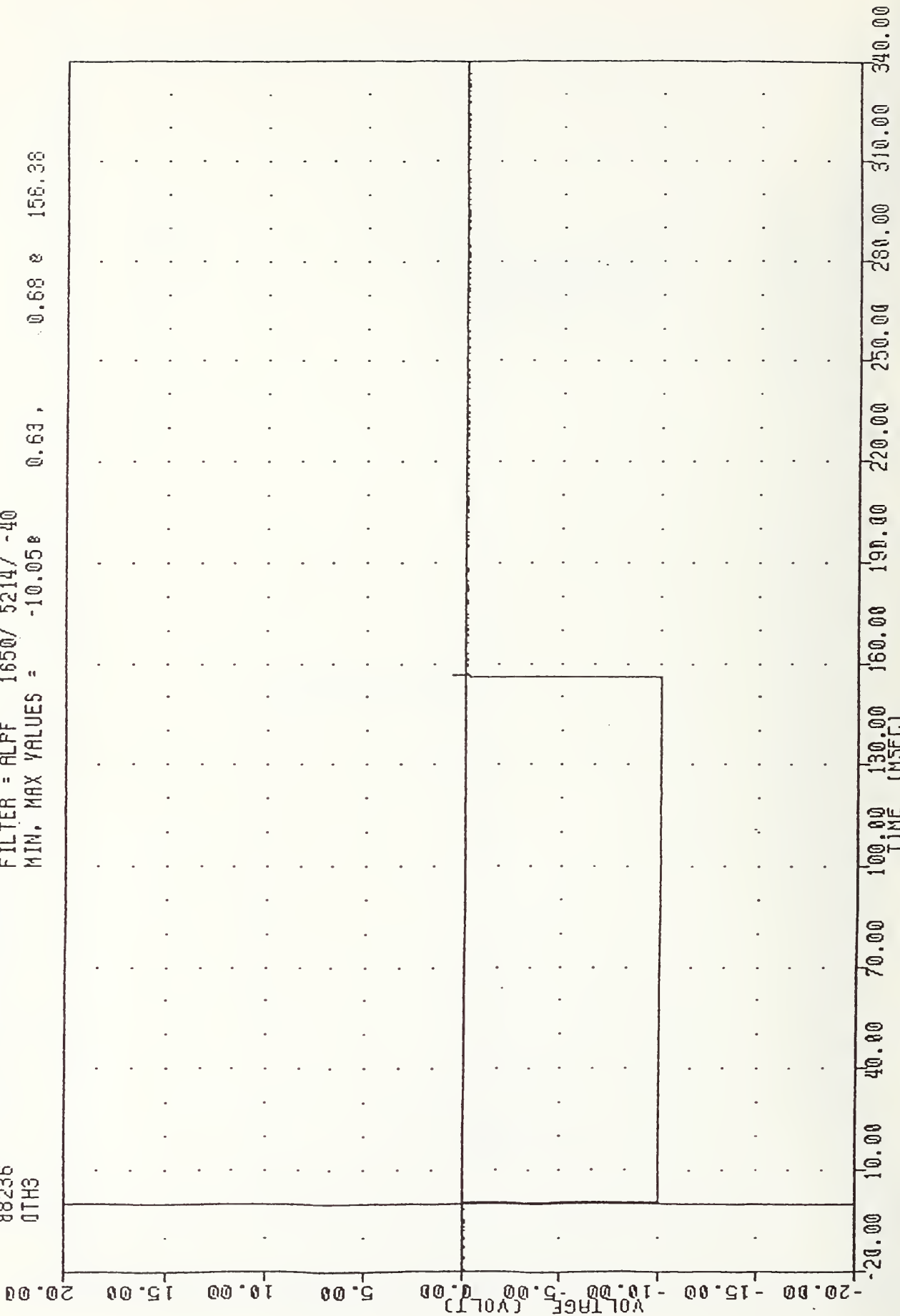
88236 FILTER = ALPF 1650/ 5214/ -40

QTH3

MIN. MAX VALUES = -10.058

0.63 ,

0.68 & 156.38



1986 FORD TAURUS INTO FLAT FRONTAL BARRIER AT 30 MPH FIFTH TEST
 CONTACT SWITCH

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EI-Habash, N

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barrier imp

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